

GAME AND GAME
COVERTS

JOHN SIMPSON

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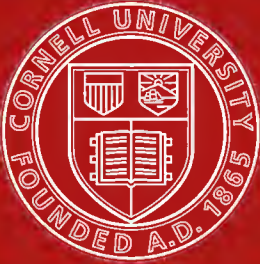
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No. 1.

HAUNT OF THE WILD DUCK.

SUNSHINE AND SHADOW.

Long Pool, made by slightly damming a small stream at a suitable spot.

Game and Game Coverts.

BY

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"Improved Pruning and Training of Fruit Trees"; Report on Horticulture (Fruit and Vegetable
Division) in "The Society of Arts Artizan Reports on the Paris Universal Exhibition of
1878"; "The Wild Rabbit and Rabbit Warrens," &c.*

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- „ 16. FURZE IN WARREN.

No. 2.

A COLD COVER.

OVER-THINNED OAK WOOD.

Over-run by bracken, which has destroyed the underwood and grass.
Forsaken by Game. A Wood that might be successfully under-planted.



No. 3.

WILD FRUITS.

Mound of Blackberry growing and fruiting over a high pile of dead Elderberry branches in an open space in the game preserves at Kirklees Hall. Two years' growth.



No. 4.

DENSE MASS OF WILLOW COVERT.

NEAR WATER.

Two years old from Cuttings, 5 to 8 ft. high.



No. 5.

DENSE MARGINAL COVERT OF WILLOW.

Tall and Dwarf Willows, 6 to 12 feet high. About three years old from cuttings.



No. 6.

WILD FRUITS. MARGINAL COVERT.

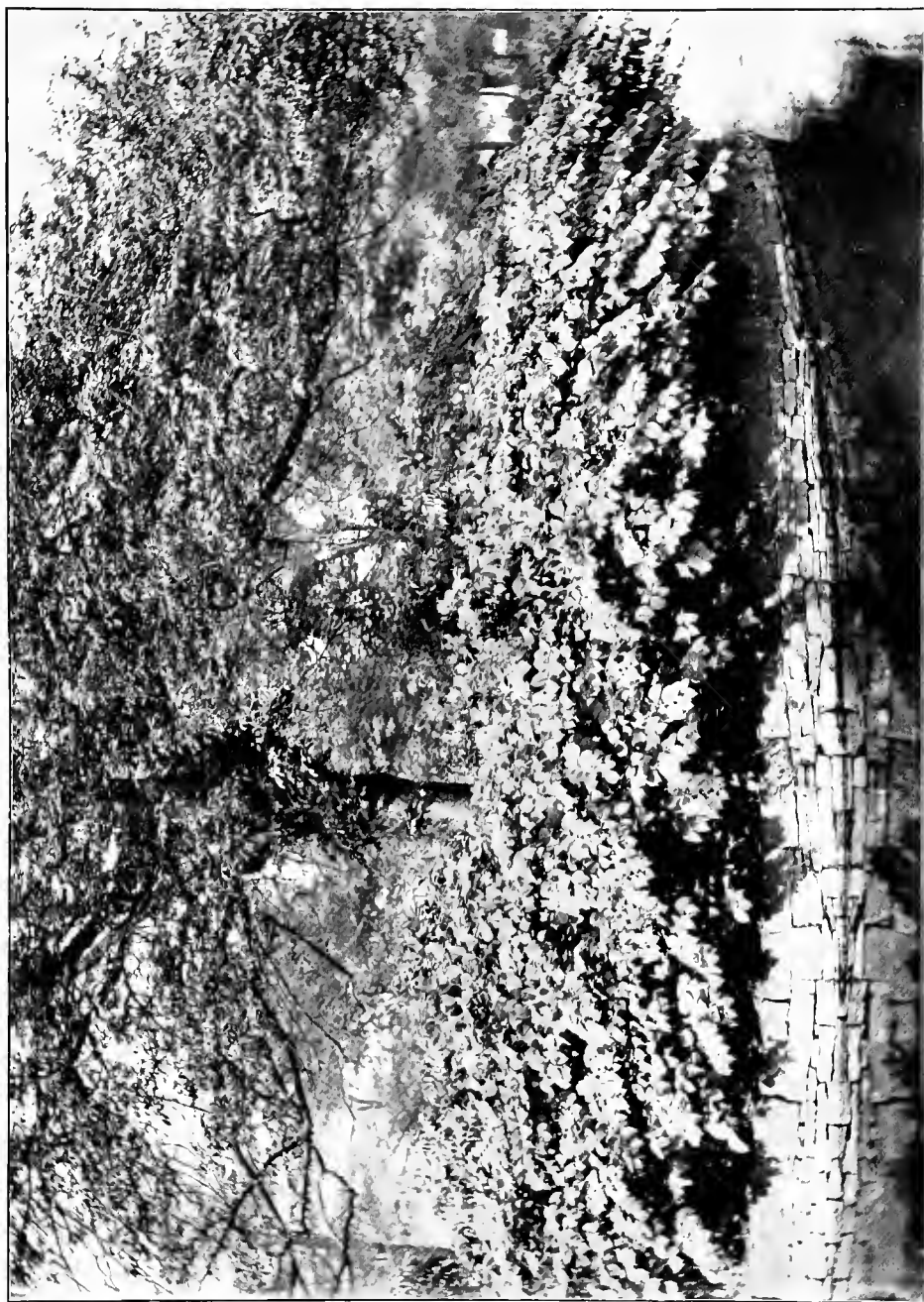
Dense mass of Blackberry in fruit in an open space in the woods at Kirklees Hall. One of the best fruit-producing and covert plants. Much neglected. The fruit is much eaten by Pheasants in October and November, but is only produced in abundance and perfection in open spaces or at the margins of woods and rides.



No. 7.

THICKET OF POLYGONUM CUSPIDATUM.

Shrub-looking, tall, strong-stemmed, herbaceous plant, 6 to 9 feet high, with thick leathery foliage. Very hardy, forms a good Covert in a few weeks. Easily worked by men or dogs. Not well-known as a covert plant, but often used in gardens as a screen. Spreads rapidly, and retains its foliage till late.



No. 8.

WARM ROOSTING TREE, CEDRUS DEODORA.

MUCH FAVOURED BY PHEASANTS AS A ROOSTING TREE IN WINTER.

Nearly 20 young pheasants have been dislodged from the tree here shown in one morning, the ground underneath the tree being usually littered by droppings like the floor of a henhouse.



No. 9.

ABIES NIGRA (DWARF SPRUCE).

GOOD MARGINAL TREE AND ROOSTER.

The tree in the centre is the one referred to.



No. 10.

PROTECTIVE. OUT-LYING DENSE COVERTS ON THE
OUTSKIRTS OF THE GAME PRESERVES.

✓ To hold Stray Game.



No. 11.

PINUS LARICIO

TRUE CORSICAN FIR.

Grows quicker and taller than the Scotch and Austrian Firs. Sparsely branched, leaves less rigid than those of the Austrian, twisted in young trees and rather glaucous in colour. Seldom seriously injured by rabbits.



No. 12.

YOUNG CORSICAN FIRS (TRUE).

Showing the characteristic habit and foliage of the tree. Part of a long line in a rabbit-infested covert.

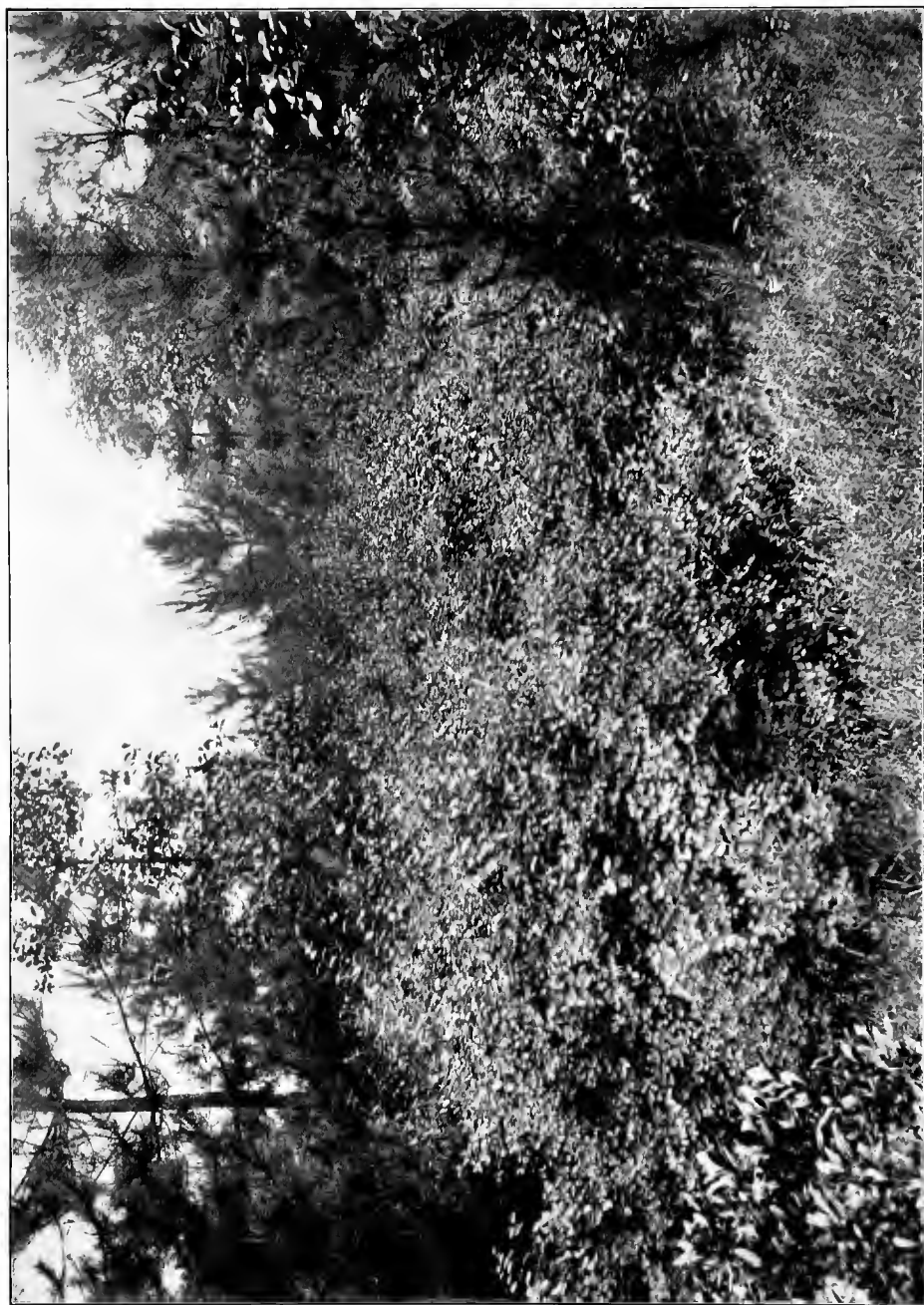


No. 13.

WILD FRUITS. SNOWBERRY.

SYMPHORICARPUS RACEMOSUS.

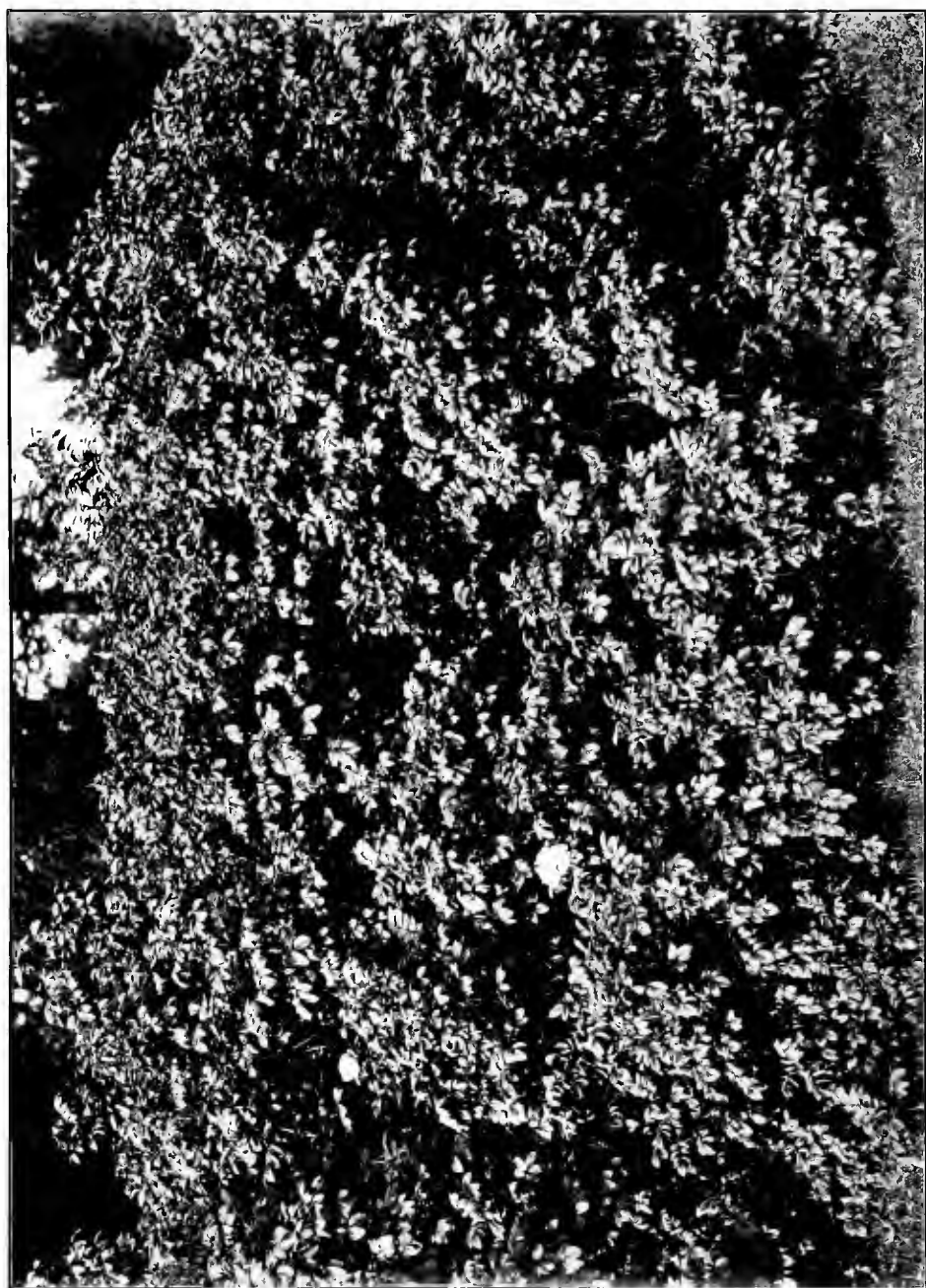
Rarely damaged by rabbits. Good shade bearer, spreads rapidly by suckers. Warm covert plant. Fruits abundantly—fruit remaining on most of the winter, much eaten by Game.



No. 14.

ROSA RUGOSA.

Robust, hardy Japanese Rose, growing in most soils and open situations. Forms a dense, broad bush about 6 feet high. Stems thickly set with sharp prickles. Never eaten by rabbits. Bears a profusion of scarlet and yellow hips about the size of marbles, which are greedily eaten by birds. Almost evergreen.



No. 15.

AUSTRIAN FIR.

A shelter tree for outside Margins but often injured by rabbits. Been frequently planted as the Corsican Fir. Varies greatly in habit. Easily distinguished from the Corsican by its more rigid habit and darker color.



No. 16.

FIELD OF FURZE OR WHIN.

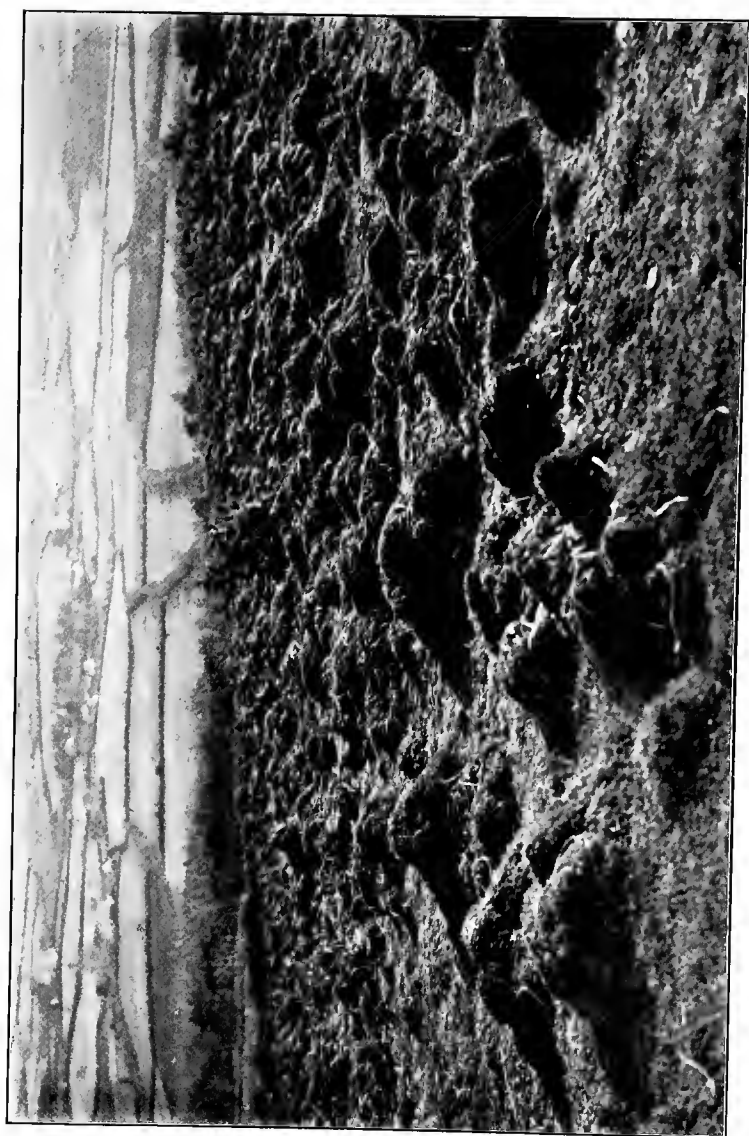
IN THE RABBIT WARREN AT DERRY ORMOND, CARDIGAN, BELONGING TO
W. INGLIS JONES, ESQ.

The whole of the Hillocks shown in this illustration consist of Furze in tufts from about 6 inches to 15 inches high, where there is next to no grass, and which have afforded food for the rabbits for many years—constant nibbling having kept the furze low and compact. The perspective will be better seen by looking at the illustration through the hand.

The following table shows the nutritive capacity of furze as compared with other green foods:—

						Flesh-formers.	Heat-producers.
Furze	...	...	...	...	...	3·21	9·38
Kohl-rabi	...	...	...	...	...	2·75	8·62
Swedes	...	...	...	...	...	1·94	5·93
Turnips	...	...	...	...	...	1·80	4·43
Cabbage	...	...	...	...	..	1·63	5·00
Mangel	...	...	...	...	...	1·54	8·60
Carrots	...	..	...	...	...	0·60	10·18

“During the Peninsular War it is stated that the Cavalry horses subsisted for many weeks on gorse, gathered by the men and chopped fine with their sabres. The horses were kept in excellent condition by this means, and even got fat on the food.”—*Land Agent's Record*.



GAME AND GAME COVERTS.

CHAPTER I.

Introductory.

PRESENT ASPECT OF GAME PRESERVATION.

Handbooks on Game.	Game Preservation and Agriculture.	Value of
Shootings.	Pheasant Disease.	Disease in Small Preserves.

THE AUTHOR of the following chapters hopes that the information offered will be useful to owners of estates who preserve game. They do not profess to deal with the Gamekeeper's duties so much as with the formation of Game Coverts that will afford protection, shelter, natural food, and provide generally favourable conditions for game preservation, combined with shooting facilities and the welfare of the woods. Without good covert of a permanent kind and properly distributed it will be admitted, we think, that the preservation of game, and especially of pheasants, is well nigh hopeless. Given good covert, and plenty of it, the keeper's duties and owner's expenses are reduced to a minimum.

The author is well aware that a number of the trees and plants mentioned in the following pages are quite common, or at least known, but it is not the trees and plants themselves, so much as their *uses* for covert purposes, to which he seeks to draw attention, believing that game preservers and gamekeepers do not make nearly as good a use of many of the materials at their disposal as they might.

Good handbooks on practical game preservation have, we are aware, been written, but on the subject of covert they are too vague and general to be useful—just describing woods or coverts gamekeepers are in the habit of seeing, not what ought to be—the subject of trees and covert plants and their right use and culture being as a rule subjects unfamiliar to the writers.

For example, in one of the latest and best practical handbooks on game rearing, great stress is laid upon good covert as being absolutely indispensable, but the instructions on that head are vague and brief. The game preserver is left to make his own choice from an indiscriminate mixture of the most dominant shade bearers, sensitive light demanders, and trees of the most diverse habit and character, that never succeed well together, and would never make either a timber crop or a good covert, while some of the best covert subjects—such as the Douglas and Corsican firs, the yew, willow, snowberry, etc., and that mainstay of the rabbit warrener (if he only knew it), the common whin, about which much is said in the following chapters, seem to be unknown to the writers.

There are other matters also, connected with pheasant breeding on numerous moderate-sized estates, that have been missed by writers and game breeders altogether, and which will be referred to in due course. What has suggested the present book has been the enquiries so frequently addressed to rural papers, and very often to the author, about providing suitable covert, and other conditions necessary to the production of large heads of game, on the most economical lines.

A portion of the matter in the book has at different times been contributed to the press, and much of it has been given in private reports on the woods and coverts on estates, in different parts of Britain, in connection with forestry.

The author may venture to say that he has had a rather exceptional experience in connection with woods and game, over a long period, and that the information offered as regards game, the arrangement and distribution of coverts, trees and shrubs suitable for covert purposes, and how to use them, has been got first hand and may be relied upon as being practical.

From boyhood to manhood the author lived among the woods and coverts, extending to eight thousand acres or more, on one of the largest Scotch estates where there was no artificial rearing of game, but where wild-bred pheasants, black game, duck, woodcock, hares, and fur and feathers of all kinds were abundant, and where lessons were to be learned that could not be got from books or such like sources.

Since then he has had an even more extensive acquaintance with game preservation on many estates throughout Great Britain where artificial rearing has been the rule, and these chapters are the outcome of that experience both ways.

That the game department on estates has generally been the least profitable, measured by its expense and losses, will we believe be admitted. Game preservation has, nevertheless, now assumed importance on most estates, and what with the worry and losses connected with landed property in the past, and threatened legislation adverse to owners of land in the future, it has become a question with many landowners to what extent they may abandon agriculture and devote their woods and fields to game and sport, which have always been among the chief inducements to owners to live on their estates, and which, more almost than anything else, has increased the residential value of landed property and kept it up when its agricultural value was going down.

Game and
Agriculture.

Already, wealthy owners, whose income is chiefly derived from outside sources, are considering the sporting interests of their estates—shooting and fishing—more than agriculture or forestry, and it is no far-fetched prediction that, as in the Highlands of Scotland, in the case of deer and grouse, game preservation may extend in England and increase still more in importance and value.

Value of
Shootings.

No kind of property lets more readily than good shootings, and instances of estates where the shooting has let for a rent nearly equal to the agricultural rent have been vouched for before now. Owners of estates have quite recently suggested the desirability of landlords keeping all the land they can in their own hands for shooting purposes, if certain proposed legislative measures become law, and there are besides great tracts of coppice on many estates that cannot be converted into timber, and that are now fit for nothing but game covert for which they are well adapted if properly laid out.

Under these circumstances it is worth while setting about the business in a systematic way.

The subjects of coverts and shelter and their judicious distribution, the trees and plants adapted to that end, in shade and in the open, food-producing plants, water, warmth, and general conditions favourable to the production of game, are all subjects of importance to owners of game preserves, but no general system has ever been adopted, so far as we are aware, to combine these agents and conditions in a comprehensive way so as to ensure the highest degree of success.

Pheasant
Diseases.

A subject too that has caused much anxiety to Game preservers, and which may be also dealt with here, is the prevalence of pheasant diseases, some of which, according to the greatest authority on pheasants, Mr. Tegetmeier, of the "Field," are incurable, and have for years been extending at a rate that threatens before long to render artificial rearing an almost certain failure.

While acknowledging the occasional utility of artificial rearing, the system approaches too nearly that of the poultry yard, though less successful, and the training and experience of the modern gamekeeper corresponds.

The system of rearing pheasants, from bought and picked-up eggs, under hens, and in coops, has been contemporaneous with the origin and spread of destructive diseases that were almost unknown before artificial rearing became common, and which are not feared now where wild pheasants only are bred. The worst of these diseases are cramp, gapes, and enteritis. The last is most to be feared, and if reports, in the "Field" and other papers, are correct, it is spreading at an alarming rate, and in many cases in spite of every precaution. This disease, according to experts, is developed spontaneously in fouled pens and breeding grounds, from whence it spreads by contagion to healthy preserves, and it is here that perhaps by far the greatest number of game preserves are affected.

For every single estate where, perhaps, thousands of eggs are put down annually, there are several where less than a thousand are put down, and a still greater proportion where the number does not exceed a few hundreds, not to mention big estates where the shooting is divided among several shooting tenants.

The owners of small preserves are usually just as ardent sportsmen as the owners of the large ones, and when their small stock is decimated or destroyed by disease, caught perhaps from the next estate, it becomes a serious matter, and the owner is driven to consider whether he will abandon artificial rearing and all its worry, expense and losses, trust to wild stock, and spend the money in extending and improving his coverts. The money spent and lost in artificial pheasant rearing would often convert poor coverts into good ones for all kinds of game.

Disease in
Small
Preserves.

The frightful ravages among young hand-reared pheasants by gapes, cramp, and enteritis have often been described in the "Field" and elsewhere, and have been such as would, in the case of any other stock, have entailed the most drastic preventive measures. The latest reports from the "Field," on the subject of enteritis alone, says:—

"We sincerely regret to announce that we are receiving daily numbers of pheasants affected with the prevalent and incurable disease One keeper informs us that on a single morning he has picked up between forty and fifty dead pheasants of all ages. It is useless asking us for any information with regard to the cure of the affected birds, for no treatment is of any avail. Immunity from the disease must necessarily depend upon the avoidance of all sources of contagion, and the disease itself may at any time be developed by overcrowding or rearing on foul ground. If game preservers will attempt to breed pheasants, crowded together in large numbers and under unnatural conditions, they can do so only by running the risk of disease breaking out, in which case the greater part of the young stock will be inevitably swept off." About a month later, September 1st, Mr. W. B. Tegetmeier again writes: "I have examined numerous examples of young pheasants, the senders in some instances stating that they have lost hundreds, and in one or two cases thousands." This is significantly corroborative of what we ourselves know. One cannot publish names of estates where an account of the mortality and waste of pheasant life would shock sportsmen, but one example, of which we have the particulars from the agent and other sources, may be given.

On an estate of moderate size only, the coverts are in proportion and near each other—hence the opportunities of changing the breeding ground are not great. Nevertheless, twenty years ago, or more, as many as ten thousand eggs or

thereabout were set under hens annually, and, owing to ever-increasing losses from disease and egg failures, that number has been increased till it now reaches between twenty and thirty thousand—not to particularise—the highest figures being nearest the mark. How many birds and eggs were lost in the rearing has not been recorded, but the number brought to the gun every season, including wild birds, has always been known and talked about, probably not been minimised, and indicates a loss in birds and eggs together amounting to nearly three-fourths of the entire stock.

As a contrast to the foregoing, and as showing what a good system and good management may do, here is an example from an estate of about 2,000 acres in the north of England, a considerable portion of which is grouse moor. The particulars I had from the owner, and the figures are from the Game Book for 1906. The coverts consist of dense, but not extensive plantations of spruce, larch, Scotch fir, birch and oak, nicely distributed, probably under 200 acres—all under one Scotch keeper. Considerably less than a thousand eggs were picked up or bought, according to the keeper, and there were some losses from various causes but little or no disease. The coverts were shot round the first time—a driving-in shoot—early in November, when 192 birds were accounted for in one day. Three weeks later 462 were shot in three days, and the third shoot in January was expected to yield between two and three hundred more. The total included the wild birds, and there was of course a fair head of mixed game. I was over the estate frequently during the year, and know all the circumstances. The agent said to me that the keeper had only one fault—"He wanted an entire field for every coop, and would never use the same breeding ground twice if he could help it." The proportion of birds brought to the gun speaks for itself, and had been about the same throughout a number of years under the same keeper.

We are not criticising either game preservers or vendors of pheasant eggs, and these statements may court criticism, but from careful enquiry we believe them to be true. From enquiries made to other owners, direct, where under a thousand eggs were put down, the proportion of losses were less—and that seems to be the rule, probably because the birds had more room and more attention. As regards wild pheasants, they appear to escape disease, practically, where not mixed with hand-reared birds.

In the latest “ Practical Handbook ” on Game Preserving it is recorded at the outset, that “ Game Preserving as we know it to-day has almost attained to the dignity of a science. The haphazard methods surrounded by a fictitious mystery which prevailed to within half a century ago have given place to carefully organised system, in which every detail is thought out, every eventuality provided for, so that the semi-artificial state which is set up may be productive and permanent.” Considering that pheasant rearing is almost the only branch of gamekeeping that the gamekeeper has attempted to bring under his special control, that the results have been what they are, and that good coverts on which so much depends, have been usually either neglected or left to chance, the claim to “ the dignity of a science ” is rather premature.

We have known many game preservers and gamekeepers in our time, sat with them and talked with them and compared notes, and in the foregoing statements we have exaggerated nothing.

In the following Chapters, the different kinds of trees and shrubs referred to have necessarily had to be mentioned, for particular uses, under several headings.

CHAPTER II.

PRESENT CONDITION OF GAME COVERTS AND GAME PRESERVES.

Habits of Hand-reared Pheasants.
Widely distributed Coverts.

Causes of Pheasants leaving Coverts.
Wild Pheasants and Vermin.

WHAT is here meant by the general term "Game Coverts" are Woods, young Plantations, Coppice, and any kind of tree, shrub, or plant-growth that affords shelter, protection and food for game—including pheasants, partridges, black game, duck, woodcock, hares, rabbits, and anything else that affords sport for the gun and which can be raised and tended on estates.

At the present time it would be difficult to find a game covert, large or small, that had been planned beforehand. As a rule coverts are what chance and the expedients of the gamekeeper have made them. Few coverts are purposely or methodically arranged and laid out, and, as far as they go, some are good and some are bad. A covert, consisting of tall timber trees with some under-growth, scope for the guns, flushing corners here and there, where the birds are expected to rise when driven, particularly if they are hand-reared, is the keeper's idea of a covert. This system of "driving" the game has become necessary owing to the habit hand-reared pheasants have of running before the guns till forced to rise by "stops" and other obstructions. Formerly, where wild-bred pheasants only were reared, it

Habits of
Hand-reared
Pheasants.

used to be the custom for guns and beaters to take the coverts straight before them in a line, the birds taking the wing as they were put up, the guns being constantly on the alert, and the shots frequent and regular throughout the whole beat. With hand-reared game, on the other hand, in long, thin coverts, it is no uncommon thing for guns and beaters to traverse the whole ground from end to end without firing more than a few shots, finish with a splutter at the far end, and then go on to the next covert and drive again and so on. We have often seen pheasants, driven out of a wood in this way, run like hares across wide fields to the nearest covert and refuse to rise even when "shooed" by the boys put there to stop them.

One gentleman, a keen sportsman, who owns extensive but thin, cold coverts, told the writer that his hand-reared birds left his coverts in winter for the more sheltered coverts of his neighbour, and that they were too lazy to fly—"they *walked* there," and the journey was of considerable length.

Pheasants
deserting
Coverts.

Pheasants deserting one covert for another, perhaps on the next estate, does happen, but not when the coverts in which they are reared are comfortable and provide natural food and water, shelter from cold winds and from wet. Pheasants come back to roost and breed where they have been bred, if they can. We have known one family of semi-wild pheasants stay on or near the same spot for several years and roost on the same trees and often on the same branches. This was in an outside spinney near a tree nursery where there was nesting covert and quiet. The birds were driven in when the outside coverts were shot, but those that escaped the gun came back. There were no spruce or warm roosting trees near, and these birds roosted about 30 feet from the ground on the naked limbs of a beech or sycamore tree, exposed to the coldest gales that blew, rather than leave the spot where they were bred.

As a rule, owners of game preserves usually favour the woods near home, and breed and keep the game there as much as possible. This may be right enough where the home woods and coverts are very extensive, but otherwise it is not a good plan to keep the birds within small areas, more particularly where disease is feared. Another reason for keeping the preserves near home is the fear of the game wandering beyond the estate boundaries ; but that fear is groundless where the coverts are good, properly distributed and quiet, no matter how near boundary lines they may be. Good covert and shelter will certainly attract game from an estate where the covert is scant, and the aspect unfavourable, but where the conditions are equal there is not much to fear. We know two adjoining estates that afford an object lesson in this respect. On one the aspect is cold and the under-covert thin, nothing but dead, flat bracken and oak trees ; and on the other the aspect warm and sheltered, with much under covert, consisting to a large extent of old hollies. There, after the cold weather sets in, the pheasants come from the cold woods across the glen, and the keeper there told us that he was always anxious, unless the shoots were arranged as early as possible, in order that he might get his own birds.

We have never been able to see the objection to widely distributed coverts, either from the shooting or breeding point of view, where there was natural food and water. On the extensive estate in Scotland, where the writer spent so many years, an even, plentiful stock of wild pheasants, that hardly ever received artificial food, was maintained, numbers of black game, wild duck, and hares, notwithstanding that game enemies, in the shape of foxes, fougarts and weasels, etc., were commoner than I have ever known them to be in preserves in England. The woods were so extensive that keeping vermin down was next to impossible. We will leave it to naturalists to explain, but we state a fact.

Widely
distributed
Coverts.

Wild
Pheasants
and Vermin.

The woods were supposed to be planted and conducted for timber, but except supplying the wants of a very large estate, and providing shelter, it was admitted by the owner that they were of more value as game preserves than anything else. The cover was excellent of its kind, much of it consisting of spruce, and silver fir, and there was much natural food. The formation was red sandstone, whin, and gravel, the average rainfall about 50 inches, and at the time of which we speak, and long before that, nowhere in Britain, we believe, were pheasants, hares, black game, partridges, and snipe more abundant. It was no unusual thing for from twelve to twenty guns to go out at a time during the shooting season.

CHAPTER III.

COMBINED TIMBER CROPS AND GAME PRESERVES.

Dense Timber Crops and Game. Planting in Blocks. Mistaken ideas
about Timber. Examples.

WHETHER owners choose to combine timber with game preservation or not, it is right to state here that that may be done successfully, and the idea often entertained by both British foresters and gamekeepers that the dense continental system of forestry is incompatible with game preservation is a delusion, and arises from a misconception of the facts. Sacrificing the one for the other is not here contemplated where such a course can be avoided. Not only may dense timber crops be combined with game preservation, but young plantations, up to twenty or thirty years of age, are amongst the best of game coverts themselves, and where there is a regular succession of woods of various ages not much else is required ; but such a state of things rarely exists, because the forestry and game departments are usually in conflict. The forester seldom considers the gamekeeper, and the latter just thinks as little about the forester. In Germany the two departments are successfully combined.

It is not often necessary to create game coverts from the beginning, because on most estates of any extent old existing woods may be converted on the same principle that it is proposed to form new coverts, and in most cases without extra expense or much trouble, as will be shown further on. Where a good mixed head of game is desired, the way is, when both woods and coverts have to be created, not to plant too large areas with a few narrow rides here and

Planting in
Blocks.

there, but to plant in groups or blocks of any size required, such groups to consist of a central block of timber trees, mixed or pure, with an outside margin of low mixed covert consisting of suitable trees, shrubs, and fruiting plants, in the full light, and between the groups an open glade where the guns may have freedom. The most excellent sport for the gun, that we ever knew of, was afforded by a small and rather thick mixed wood, on a rising ground about 150 yards long by 100 yards wide, with a field on one side and a wide glade on the other. On each side most of the guns were posted, the beaters bringing up the centre in a line. The pheasants, wild ones, usually rose at once, and the hares bolted through the hedgerows. The shots were constant, mostly high in the case of birds, and hardly one escaped good shots.

Hitherto the fault has been to mix trees and low covert indiscriminately, a thing which cannot be done successfully, because the timber trees must be too thin to constitute a crop in order that low under covert may live, as very few species can endure much shade. Hence one often sees either thin woods with a tangled coppice, or dense woods where there is little or no under covert at all.

Now, supposing 500 acres were laid out in the grouping or block system, according to soil and situation, by far the largest portion would consist of timber and marginal covert, and the rest of glades, and a wood so laid out would at the same time afford one of the most pleasing sylvan scenes that one could imagine. Such examples are occasionally to be seen now, though they have not been created intentionally, but they show what is quite practicable.

The number of species of trees, shrubs, and berry-bearing plants, suitable for all situations, at the disposal of the planter for covert or ornament exceed his wants, and he has only got to pick and choose, as will be seen when we come to speak of under and open covert.

The idea entertained by some that timber cannot be grown to profitable dimensions of the right shape on the grouping system is another mistake. The fact has been demonstrated, times without number, that it is just as easy to grow timber on small areas as on large ones, and few woods exist where examples are not to be seen. If, for example, three trees of any species are planted a few feet apart, in the form of a triangle, and a fourth tree is planted in the centre of the triangle, the latter will become a clean, shapely tree, and the three outer trees will in time have branches on their outer sides only. This is silviculture on the smallest scale. If the number of trees in the group is doubled, trebled, or quadrupled, the number of clean inner trees will be in proportion, and so on *ad infinitum*. A covert laid out in this way might be reared in a few years from the beginning, and old woods may easily be converted on the same principle.

Mistaken
ideas.

On certain estates this plan is being carried out now as follows :—In a long glen, through which a small stream wends its way, insuring a constant supply of water, the plan suggested and adopted has been, first, to plant pure or mixed groups of larch, Douglas fir, spruces, and different kinds of useful hardwoods, timber trees, widely apart over the whole area. These constitute the timber crop, as it were, but provide covert as well. The groups are of free, informal shape, laid out with judgment, and round each is planted a belt or border of sufficient width, consisting of lower covert trees, shrubs, berry-bearing plants in profusion, and plants and grasses of various kinds, while in and out among the groups wind grass glades or drives throughout the entire tract, the whole forming a semi-ornamental but natural-looking wood—constituting, really, a wild garden, a wood, and a covert in one. What to plant, and how and when to plant in this way will be fully described in the chapter on Marginal Covert.

Example.

CHAPTER IV.

ARRANGEMENT AND DISTRIBUTION OF COVERTS.

Coverts that suit Game generally. Widely distributed Coverts and Disease prevention. Aspect. Water in Coverts. Home Woods. Advantage of numerous Coverts. Converting old Woods into Game Coverts. Bracken a bad Covert. Destroying Bracken. Value of Coppice as Game Covert. Live Fences. Stream and Lake Coverts for Water Fowl.

FIRST, it may be stated that the best stocked coverts are found where the agriculture is mixed, and that coverts that will suit pheasants will suit nearly every kind of fur and feathers usually classed under the head of game, and which frequent woods. On estates where there is hill and dale, marsh and water, certain kinds of game, such as duck and snipe will locate themselves according to their nature ; but pheasants, black game, capercailzie, woodcock, partridges, hares and rabbits, breed in and frequent the same coverts. Black game are to some extent an exception. They are supposed to, and no doubt do, prefer secluded retreats ; but they are not strangers in big woods in some of the busiest and noisiest manufacturing districts where they can find the food and covert they like, and they will sometimes approach the vicinity of human dwellings. We have known Black cocks to come on to the lawn in pleasure grounds in the morning, where wild pheasants were also numerous, and strut about in sight of the workmen. This game never seems to be very abundant, however, even under the most favourable conditions, compared to other game, probably because they are

naturally less prolific. In one large wood in Yorkshire, where they were, and are, strictly preserved, and never shot, there have been several broods for thirty years, to the writer's knowledge, but they do not seem to increase in numbers, nor, as far as has been observed, do they ever leave this wood for other woods on the same estate, probably because the wood which they favour contains much natural food in the shape of bilberries, blackberries, birch, heath in open places, and mountain ash ; whereas the other woods contain next to none of these, and are much disturbed by pheasant rearing. The absence of Scots fir and spruce no doubt also explains their scarcity in the wood which they do frequent. In certain woods in Scotland, where there is much fir, and where the Douglas fir has been long and extensively planted, the capercailzie and Black cock are more plentiful than anywhere else, as far as we have observed. Signs of their presence are visible everywhere round the trees ; but keepers in the north declare that Black game grow scarce as the capercailzie increases, and they prefer the former for sport.

As regards the general distribution and arrangement of coverts, they should be laid out so as to secure protection from cold, especially cold winds during winter, and shelter from wet, should afford sunshine and shade, provide natural food and water, be free from wire netting fences or any fences that hinder very young pheasants from following the old birds, and for the same reason open drains in woods should not be too deep and narrow, but have easy sloping sides up which the birds can easily scramble, and nothing should be neglected that will induce game to breed and stay in the coverts.

Distribution
of Coverts.

It is better that every wood and copse on the estate should be a covert, and detached coverts should be as numerous and as widely distributed as extent and circumstances will permit, and should extend to the limits of the estate. (Plate 10.)

Under natural conditions pheasants and other kinds of game distribute themselves rather thinly. There is a great difference between hand-reared and wild birds in this respect. The former, for the first year at least, run very much together, encouraged no doubt by the method of feeding usually adopted. We have counted nearly as many as fifty pheasants collected together in one corner of a big wood after the coverts had been shot over more than once—a thing seldom or never seen where the pheasants are wild. The wide distribution system cannot of course be carried out on the same scale on estates great and small, but in principle it may, and it has the advantage that the risk of disease is much less as is also the expense of tending. There are estates where wild game is plentiful and spread over very wide coverts, where the gamekeepers' dwellings are miles apart, and where the number of keepers and tenters employed are about half as many as are sometimes employed on Norfolk estates not one-tenth of the size, and where the woods do not exceed one thousand acres.

It is surprising how soon pheasants and other game find out a new covert of the right sort. On a certain estate where evergreen covert was scant and the woods thin, a plantation of fir trees was planted parallel to an older plantation of hardwoods, and by the time the firs were three-and-a-half feet high it attracted and held numerous pheasants and afforded excellent sport. The trees were thickly planted, are now about twenty feet high, and constitute the best covert on the estate, being warm, shutting out both sight and sound, and nowhere too wide.

The dense willow-patch, Plate 5, wild pheasants from distant coverts found and nested in the second year and raised good clutches.

That the plan of extending the coverts over as much ground as possible prevents disease among pheasants is admitted now on all hands. Crowding, either in game preserves or rabbit warrens, contaminates the ground, and restorative measures—except rest, in woods at least—are impracticable.

In laying out coverts, or in adding to them, a good deal will depend upon aspect and other circumstances. Dry slopes and knolls, or rising grounds on sunny aspects are the best spots on which to form coverts, if in the vicinity of water so much the better. Indeed water is an absolute necessity in or near coverts on dry soils ; and in dry localities, where streams or brooks do not exist, means should be taken to provide a supply of water—if in the form of a natural runnel, all the better. Sometimes a supply of water may be secured in connection with a hydraulic ram where one is employed on the estate, and sometimes small pumping wind-mills might be employed for the purpose. In any case a constant supply of water in some form throughout the year ranks next to food in keeping game on the ground.

It would appear, however, that wild bred pheasants, partridges, and black game, do not require as much water as hand-reared pheasants that receive so much dry food. The first appear to get as much water as they require in the natural foods, fruits and grasses that they pick up. We have known thriving clutches of young wild pheasants that did not leave the vicinity of the nest where they were hatched for weeks, although there was no water within their reach except when it occasionally rained or there were heavy dews. In one large wood, remarkable for the number of wild pheasants it contained, matched by an almost equal number of hares, there existed no natural supply of water except in a few running open ditches widely apart, and open drains in the wood that only ran for a few hours after heavy rains. Indeed in all

Aspect

Water.

our almost daily wanderings in this wood and others like it, and familiarity with the haunts of pheasants, we cannot say we ever saw a wild pheasant drinking. Tame pheasants may often be seen drinking, like poultry, out of the dishes set near the coops in coverts.

Home Woods.

Home woods, or woods near the mansion we have alluded to before as being favoured by game preservers for several reasons, not always good ones. A home wood, or a favourably situated big wood, might form the central block in a set of coverts, but if it is surrounded with smaller plantations or coppice at no great distance from each other, and at all events in sight, so as to link the whole together for systematic shooting, it will be found that the game will distribute themselves pretty evenly throughout, and every clump of covert will afford good sport in a drive from the outside to the centre, or to whatever point at which the day's shooting may end. While, however, it is advisable to convert every small dingle or spinney that does not interfere with tenants into a game covert, outlying coverts should not be too small, and they may be of any shape. From half an acre upwards to several acres makes a good clump. Such clumps should be full and warm.

Numerous Coverts.

One great advantage of having numerous coverts of moderate size, in which game can hide and breed, with corn or grass fields between, is that the game can come out to feed or bask in the sun without having to go far. This is particularly the case with pheasants and hares, both of which may frequently be seen in the same grass fields at certain times of the day throughout the year. Pasture and stubble fields are most frequented, but the latter are not the absolute necessity that many keepers imagine. At one time we lived for several years close to a solitary plantation covert of a good few acres, far from corn and other farm crops, the covert being surrounded on one side by a permanent sheep run, and

on the other side by an extensive cattle pasture where clover and good grass were always abundant. The sheep pasture was not so much frequented by either pheasants or hares, but the cattle pasture was, and at certain times of the day both might be seen in considerable numbers feeding among the herd of Galloways that grazed there. These pheasants were not artificially fed; indeed it was only at rare intervals that a keeper came that way on his long rounds. I do not think that the pheasants ever left the wood or grass fields from one year's end to the other, but when the shooting season came round the wood always afforded good sport and the birds mostly broke on the grass field side for the wood beyond.

Converting old and thin woods into good coverts is a much easier and less expensive process than planting new ones. On most estates the woods are too thin, the underwood scant and of the wrong kind. Plate 2 shows a naked covert of this kind, a very common example in its way. This wood is about fifty acres in extent, consists chiefly of oak, thinly distributed, contains no underwood or covert whatever, the ground being covered throughout by rank bracken which, after the rains and snows of autumn and winter, lies flat, an unbroken dead expanse where there is neither food nor shelter, and where no game stays long.

Converting
Old Woods.

Rank bracken, and bracken only, is no cover for game of any kind. It kills the grass completely, and provides no natural food for birds. The wood referred to was once a first-class game covert until much of the timber and underwood was cut down. The underwood never got up again, owing to rabbits and the bracken—one ate it off and the other smothered it. It is not realised to what an extent the common bracken has overrun many over-thinned English and Scotch woods, making planting very difficult and destroying coverts. In the partial shade of thin woods it

Bracken
bad Covert.

grows six feet high or more, and never dies out, as it produces an enormous quantity of *humous* annually, on which it lives, and besides, its seed is scattered far and wide. Had only a portion of the money, lost in failures in the hand-rearing of pheasants, been spent in restoring the wood mentioned, it might still have been a good covert; now it is a waste, that can be seen through from side to side—an unbroken expanse of dead bracken, fifty acres in extent, where pheasants are only attracted by constant feeding on bare spots. Such thin woods are easily dealt with if the work is set about in a systematic manner. Instead of thin, random planting of doubtful species here and there among the standing timber trees, the wood should be tackled boldly. In order that it may not have to be disturbed for a long period, all the oldest timber trees of value should be cut and sold in the usual way. After that the wood should be thrown into large groups or blocks from one to several acres in extent, by clearing the timber and cutting wide alleys and glades in every direction through the wood. The groups left should then be filled up densely with suitable timber trees, such as larch and hardwoods in the very thin parts where there is light, and in the more shaded parts, by silver fir, Douglas fir and common spruce, all three of which are shade bearers; while the open margins of the groups may be packed with low covert trees, bushes, grasses and wild fruiting plants, which are described in the chapter on that head.

The conversion of an old and thin wood, probably containing less than a quarter of a crop of timber, need be neither a long job nor an expensive one. As a rule, the timber cleared out and sold judiciously should go far towards paying all expenses, and if the groups left are packed full with young timber trees, on the dense system, there will be a far more valuable crop of timber on the ground than there was before, and a good game covert as well. We draw attention to

this subject particularly, because there are many such old woods—too thin already to stand more thinning, or too thin for game—which owners often do not know what to do with, and that break the hearts of gamekeepers.

Where bracken exists it may be rapidly destroyed by thoroughly harrying it with a heavy brush harrow in June, when the bracken is tender and brittle and bleeds. If this is done at the right season the bracken will die out in a year or two and grass will take its place, but grass seeds may have to be sown. Grass is usually killed out under heavy bracken.

Destroying
Bracken.

There has been much complaint of late years about bracken spreading over pastures and woods, destroying the value of both, and prizes have been offered to inventors for machines to destroy it; but there is nothing better, or as expeditiously made, as a heavy brush harrow of thorns. If a good heavy oak pole, about 10 feet long, is cut into three lengths, and the three chained together end to end and well loaded with rough thorn branches, and trailed over the bracken backwards and forwards, it will tear it sufficiently to stop its growth and make it bleed and die. Cutting the bracken down close to the soil is not needful. It will die down if harried enough, and a man with a pony can harrow many acres in a short time. The object of cutting the pole into sections is to let it lift on rough ground or in going over stones. It is here that rigid iron machines are at fault.

Under the comprehensive fiction, in the Agricultural Returns, entitled "Acreage of Woods in Great Britain," are included Coppice crops, which have about as little connection with woods and plantations, as popularly understood, as osier or hop crops, and which, if deducted from our timber woods would probably reduce their supposed extent by one-third if not more. It is time a distinction was made between the two, and we are much mistaken if the Coppice question does not become a burning one before long among owners.

Coppice
as Covert.

Coppice is now practically worthless, and ought really to come under the head of "Waste Lands." The rating of Coppice is also excessive and unequal, and seems to be ordered on no intelligible principle, the rates being about the same as they used to be when Coppice was a successful crop.

The question for owners, in the meantime, is what to do with such waste areas, and we can suggest nothing better than conversion into game preserves, which would be neither difficult nor costly.

There are two kinds of coppice, one kind consisting chiefly of a mixture of oak, ash, sycamore, chestnut, and alder, five species which, when regulated, may be converted into valuable timber crops. The other and more common kind usually consists of pure hazel and low underwood, species that can never be anything but coppice, of a kind that is now almost quite valueless to owners. Both kinds of coppice may be converted into excellent game covert in the same way, but the last-named is now of no use for any other purpose.

The faults of coppice for shooting purposes, as usually grown, are that it is in too large areas, is usually too dense, and often too high to shoot either through or over, and without roosting trees. Otherwise, anything better, in the shape of ready-made covert, we have never seen either for fur or feathers. As a rule coppice is usually too old to be seriously injured by rabbits, and it affords them food, while grass is seldom absent. There is always much humous in the ground and myriads of insects and grubs pervade such thickets. Enormous numbers of rabbits can exist in dense coppice, but in order to shoot either them or pheasants in such places it is necessary that broad glades should be cut out in every direction for the guns, leaving the coppice in blocks not too large to work. These glades will produce good grass, and may even be grazed by cattle or sheep with-

out hurt to the coppice. In the south of England especially, there are thousands of acres of coppice at present of no value to the owners, so dense on the ground as to be impenetrable, and only needing to be opened up to be converted into a game preserve of the best description.

Gamekeepers like plenty of rough, unkempt live fences, because pheasants nest in such places, but nowhere are the nests so easily found as in hedgerows, and egg poachers know it. Live fences are not needed for nesting purposes, or covert either round woods or fields, provided the margin of the woods are pretty dense and rough and the outlying coverts pretty well distributed.

Live Fences

Wild duck and waterfowl require special conditions of their own. Water is the first essential, and the more of it the better if it is not too open and wide. Cover may consist of low trees and bushes and tall grasses, such as are described in the chapter on these. The best stocked wild duck preserve that we ever knew, consisted of long, still pools, on a salmon stream thickly lined with trees, bushes and tall grasses on each side. There, night and early morning, numbers might be seen crowded together in the middle of the stream, and had to be warily approached. They bred on the margin of the stream, and we have occasionally and unexpectedly, when fishing, put up young clutches, apparently only a few days old, that flung themselves headlong into the water to escape. Of course it is not every one that can have wild duck covert like this, but wild ducks will frequent very small brooks where there is good covert near the margin. We have known wild clutches hatched successfully in a populous colliery district at the side of a quite small brook. On the other hand wild ducks do not greatly frequent extensive reservoirs where the margins are bare, however quiet they may be, and they seem to avoid high elevations. There are often bare glens

Duck and
Waterfowl
Coverts.

and ravines, with running water, on estates, that might soon be converted into duck coverts. If the water supply is constant, however small the brook may be, it will do, and if it is dammed at intervals to form small pools it would be a great improvement. Two oak trunks or logs flung across the bed of the brook, one above the other, and bedded in clay will be a sufficient block to form a pool of considerable size, if the position is properly chosen, and would not stop fish if a short fish ladder was placed at each pool. In this way a very small brook may be converted at little expense into a chain of pools for both fish and waterfowl. (Plate 1.) Clothing the banks on each side with covert trees and plants for some distance back is however necessary to shut out sight and sound. For a back line, to heighten the banks on each side, there is nothing to match the Douglas fir for fast growth where it will grow, and for rapid growing deciduous trees the common poplar and willow cannot be beaten. The dwarfer, free branching willows, backed by the tall white Huntingdon variety, will produce a dense cover 10 feet high from cuttings in two years. In front of these, next to the brook, and also among the willows, the common cocksfoot grass will grow tall and thick and provide low covert. Any of the tall grasses that are found growing in shady woods and in damp places may also be planted or sown near the water. The hardy dwarf Japanese bamboo, also, is becoming known as a good covert plant in such spots, and is found to succeed well in many parts of England and Scotland. Where time is an object, the willows themselves will make an ample and tall covert in three years if cuttings two to three feet long are put in and stuck deeply into the soil in March. Other natural plants and grasses will spring up spontaneously amongst them and afford shelter and nesting places. We have known wild ducks, pheasants, and partridges to nest in a dense clump of the common nettle. Ducks seem to find food among water weeds, but, unlike coots and water-hens, they do not seem to seek shelter among bull rushes or other

tall aquatics actually growing in the water. They are most frequently seen on the open water or on dry ground in its vicinity.

On country estates one often sees bare hollows and depression in the land, along water-courses, that might with little trouble be transformed into a useful duck and game covert at the same time. When such spots, and narrow ravines with steep banks on each side, are planted, the mistake usually made, as far as covert is concerned, is that the banks are planted with the same species, whatever they happen to be, from top to bottom. The result is that the trees at the bottom grow faster than those higher up, until the tops of the trees are nearly level, and the configuration of the ground lost. Underwood and vegetation then dies out, killed by the shade, leaving the ground bare underneath.

Judicious planting will prevent this, add greatly to the height of the banks on each side, and admit a flood of sunshine to the bottom of the ravine and the stream, if any. This may be done by planting the tallest growing trees, like the Douglas fir, *Abies Grandis*, Silver fir, Common spruce, and tall hardwoods at the top of the banks on each side, dwarfer trees lower down, ending with the still dwarfer bushes and plants at the bottom, and leaving the margin of the brook and pools bare and room for a path throughout. Hollows and ravines shut in in this way become sheltered suntraps, and are soon found by birds and game. Planting the higher edges of the banks with tall trees that grow fast very soon transforms even a shallow hollow into a deep gully or glen, and it is down at the bottom of such sheltered spots that brambles, briars, wild raspberries and other wild plants adapted for cover grow most luxuriantly. We have at times seen the most extraordinary crops of blackberries and wild fruits in such places. We know narrow, deep gullies in the highlands of Scotland where the temperature is almost tropical on sunny days, even as early as April, and where vegetation is always luxuriant.

CHAPTER V.

OPEN MARGINAL COVERTS.

Rhododendron too much used. Suitable Subjects. Good Natural Covert.
 Bramble Covert. Polygonum. Planting Marginal Covert.

IN the chapter on Combined Timber Crops and Game Preserves it has been explained what is meant by Marginal Covert, and it is proposed here to give some particulars of the kinds of trees and plants best adapted for the purpose.

Marginal Covert is that portion of the covert or wood not shaded by trees, and consisting of low trees, bushes, plants and grasses.

Although good covert of this kind is easily and quickly got up, it is seldom seen. Margins of woods are usually bare, while futile attempts are made to grow underwood among the timber trees by planting species that will not endure shade for long, and which are eaten by rabbits.

The common rhododendron ponticum has been a favourite subject till now for planting along rides and in woods, but it is not now regarded with so much favour for pheasants, because wherever the plant has light it grows much too dense and compact and pheasants will not go into it. Under the shade of timber trees it grows more loose and lanky, and I have seen young pheasants perching on the bare limbs in the daytime; but it is neither a roosting tree nor a good covert plant. Rabbits will rush into the densest

Rhododen-
dron.

bush, and in the open there is no kind of covert they like better or from which it is more difficult to bolt them or dig them out. A single rhododendron ponticum bush will soon cover much space, because the branches extend and root out and the rabbits burrow amongst them. There are rhododendron bushes growing in pure clayey loam in Yorkshire that are nearly a hundred yards in circumference, and as close round the margin as a clipped hedge, but they are a harbour for rabbits only.

The rhododendron suits neither the pheasant nor the hare. The rabbit will *squeeze* itself through a thicket, but the pheasant will not—it *creeps* through or under. The only claim the rhododendron has is that it is practically rabbit proof even in a warren, but while there are so many better subjects it is hardly worth extensive planting as game covert. The list of subjects suitable for marginal covert is a long one, but the following are amongst the best, are ornamental as well as useful, not too close in habit, and some of them bear enormous quantities of fruit that pheasants and wild birds eat greedily:—First, of what we may call marginal *trees*, we have the common hawthorn, crab, wild cherry, myrobolam plum, yew, mountain ash, holly, the dwarf *Abies nigra* and *alba*—two neat and ornamental spruces, and very hardy, and the Deodar.

Suitable
Trees for
Margins.

Of other subjects, ranging from three to fifteen feet, or thereabout, we have the common sweet-scented azalea, tall common barberry, an abundant fruit bearer in the north; mahonia, common briar or wild rose, Penzance briar roses, common bramble, *Rose rugosa*, elderberry, “common” laurel (not the Portuguese), *Cotoneaster fridida*, *Cotoneaster simonsii*, privet, common furze, black-thorn or sloe, dwarf willows, yellow or red-barked; wild raspberry, the snowberry, and *polygonum caspidatum*, the latter a comparatively unknown but valuable covert plant.

Among grasses, two grand subjects that will grow anywhere and in any soil, though they may not flower, are the Pampas grass, *gynerium argenteum*, and the hardy Japanese bamboo. These two are good nesting subjects, as there is always more or less dry straw and cosy corners about them. Tall native grasses are also sure to spring up, and help to thicken up the mass, provided no useless pruning or digging is attempted.

Good natural
Covert.

Nurserymen's catalogues of plants "specially adapted for game covert" include more species than the above, but they are for the most part slow growers and of too compact habit, like the Arborvita, Acuba, and box, which are expensive as well, and afford no cover worth speaking of. The above list is enough, but marginal covert may be formed of even fewer species than are here named where a large number of species is not desired or cannot be had. As good examples of natural covert as we have ever seen consisted wholly of thorn, wild briars, blackthorn, bramble and holly—once planted to form a hedge, and afterwards neglected till they had grown into a high, broad, and tangled mass that no cattle could penetrate. Some of the finest examples of this kind are to be found in East Yorkshire, in Norfolk, and in Devon. Such protective margins may soon be formed round woods or coverts if planted in proper proportions at the first and tended for a year or so. The trimmed, dug, and clipped hedge is a poor thing by comparison. Gamekeepers do not realise what three valuable subjects they have got, if they would only use them more, in the thorn, wild briar, or rose, and bramble alone. The bramble is without doubt one of the very best covert plants and natural game-food producers we have got. It is labelled deciduous by some botanists, but it is evergreen, in woods, often knee deep, covering acres where there is no bracken, and bearing fruit from October till December or later, but never in such quantities or to such

perfection as it does on the sides of open rides and where it is not shaded by trees. In open spaces it is a marvel of fertility. Plates 3 and 6.

Incidentally, it may be mentioned of the bramble as a fruit bearer that the extent of the blackberry harvest in many parts of England does not seem to be known. In Buckingham, as in East Yorkshire, Sussex and elsewhere, the bramble has in many places covered both dead and live fences, and gathering blackberries for the market is a daily occupation for country people in September and October. Labourers leave their regular work to go "black-berrying," earning as much as 5s. per bushel, and one family will gather several bushels in a day. Buyers travel districts, once or twice a week, and buy all that are offered. Tons come into provincial towns from these sources, and small fruiterers and hawkers will sometimes lay in as many as eight or ten stones in one day.

Not less palatable to game than the fruit of the bramble are the grubs and insects that follow in its train.

Plate 3, shows a mound of bramble, about 6 feet high, made by throwing some dead elderberry branches over a bramble bush and allowing the latter to push up through it, forming a mass of fruitful covert. North and south the bramble produces shoots from 10 to 15 feet long annually, and these grow over anything in their way to reach the light, and bear freely the following season. So rampantly does the bramble grow in some localities that it would smother young plantations ten feet high if it was not periodically cut down. We have seen it in the south of England and elsewhere, in young larch woods, where it over-topped the trees and filled the space between the rows with its long shoots. The wild raspberry is almost as good as the bramble for covert and as a food-producer, but it does not

Bramble
Covert.

grow freely everywhere ; whereas the bramble is in every lane and wood from John o' Groat's to Land's End. We have gathered quarts from a few patches growing over a fence in Scotland. Both the bramble and raspberry are very plentiful in those parts of Scotland, where wild pheasants do so well. There are now two or three cultivated American varieties, of which the "parsley leaved" is the best ; but the common bramble is as good or better, under equal conditions, and is by far the best flavoured. Birds and pheasants prefer sweet fruits.

Polygonum.

We have named the *Polygonum cuspidatum* as a covert plant as yet unknown. Though long in the country, and regarded almost as a weed, it has not yet been used as covert as far as we have seen. It is a tall, strong-stemmed, noble-looking herbaceous plant of shrub-like appearance, and is well known to gardeners for planting as a screen and for back lines. It is very hardy, grows anywhere and in any soil, endures shade, extends itself quickly by suckers under the soil, and grows from six to ten feet high annually, and fading in winter, though the stems stand erect for a time. Every bit of root throws up stems, and, according to garden experience, it seems to be quite a unique subject for covert purposes, especially where cover is wanted quickly. The plant pushes early in spring, and by July is a mass of tall, stout stems, covered with ample leathery foliage. It provides harbour for game and is easily worked by either dogs or beaters. We know no plant that provides such a mass of dense, yet easy, covert so quickly, and it springs up as fast as it is cut or broken. It does not seem to be eaten by rabbits any more than nettles or bracken, and may be got up in big patches the first year by dibbling in bits of the roots. Plate 7 shows a group of the plant, six to eight feet high in August. Filling up vacant spaces of any extent with the plant is only a question of weeks.

In planting marginal covert, and having decided what its width is to be, the skeleton should be set out first by planting the *trees* about twenty or thirty feet apart on the back line, keeping the tallest at the back, but the line may be an informal zig-zag. Plenty of the two little Canadian spruces, named before, may be used, as they are roosting trees also, and afford almost complete protection from wet and snow under the lower branches. Both the Canadian spruce and the Deodar may, however, have their bottom branches cut clean off to about fifteen inches above the ground to let the pheasants run under. Practically no grass grows under these trees, and the surface is dry even in wet weather unless the downpour is excessive.

Planting
Marginal
Covert.

After the back lines have been formed the dwarfier shrubs and plants may be put in from about six to ten feet apart, mixing judiciously so as not to look formal.

After marginal covert is planted, the less it is meddled with the better, unless it may be to remove or relieve a plant here and there. The covert will in a few years become almost impenetrable, hence gaps should be left at intervals to get out of or in to the wood.

CHAPTER VI.

UNDER-COVERT.

Wrong Covert Mixtures. Shade Bearers. Planting in Groups.

BY Under-Covert, is here meant covert under timber trees where there is more or less shade. Hitherto, in our thin woods, any species have been used for this purpose without regard to their shade-bearing qualities or adaptability.

It has been stated before, that young timber plantations alone, either mixed or pure, will provide covert up to twenty or thirty years of age, and no under-planting is needed. Sometimes, however, the mistake is made of planting a covert of timber trees and covert plants at the same time, with the result that the strong-growing and shade-bearing trees overgrow the weaker species, which die and disappear as if they had never been there. Here, for example, is a mixture of trees, that was planted by contract, in about equal proportions, as a covert and timber crop, a very common example in its way:—Elm, spruce, beech, Douglas fir, larch, oak, ash, Spanish chestnut, mountain ash, hazel, privet, birch, rhododendron, and dogwood. Of this mixture, planted alternately and pretty closely, the beech, spruce and Douglas fir would rapidly take the lead and crush out the oak and ash, and before that the birch, hazel, privet, and other dwarfer shrubs would

Wrong
Mixtures.

have dwindled to mere weeds or disappeared altogether. It is a needless waste of time and money to plant indiscriminate mixtures of species differing greatly in size and habit. Shade-bearers, in woods where the over-head canopy is already established, and marginal planting fulfil every purpose.

Under timber crops, worthy of the name, there are certain shade-enduring species that will succeed well enough for covert purposes, and these only need to be used. Under the very dense shade of the beech, spruce, Douglas fir, and sycamore, nothing will grow long, but they produce a good high and low cover by themselves.

Shade
Bearers.

The best shade-bearing species are the beech, common spruce, Douglas fir, and silver fir, among trees ; and among dwarfer species the common holly, yew, Japanese and common privet, snowberry, rhododendron, elderberry, and, in not too dense woods, the common willow.

Among trees, the beech is by far the best shade-bearer. We have often seen it growing in this country and in Germany in dense shade, where nothing else could have long existed. It does not grow as densely under shade as it does in the open, but healthy, well-branched trees, growing under other trees where no light reaches them except what filters through the leaf canopy overhead, may often be seen.

If the beech is planted thickly enough in patches in a wood, it will soon form a thick covert and shelter, in summer or winter, that nothing can excel, as it grows fast, and young trees keep their leaves during winter.

The Douglas fir, common spruce, and silver fir, are also all good subjects for under-planting. Their habit is thinner in a wood, but when planted in small groups they are quite dense enough and make excellent covert and roosting trees. We have seen Douglas firs eight or nine years old nearly thirty feet high, and well furnished with good branches, in the partial shade of oak trees.

Among the dwarfer subjects the common holly and yew may be named first as shade-bearers, standing midway between trees and shrubs. No species surpass these two in that respect. Both, too, are warm trees in winter. In the extensive fox coverts in Dalkeith Park there used to be, and is still, we believe, one of the finest examples of a yew covert, growing under an almost continuous overhead canopy of oak and other deciduous trees.

The snowberry and common and Japanese privets rank next as shade-bearing shrubs. We doubt if the snowberry is surpassed as a shade-bearer, rabbit-proof subject, and covert plant (Plate 13). We have planted many clumps of it, with an equal proportion of privet, where rabbits were numerous, and, while the privet was damaged by the rabbits, the snowberry escaped and soon formed good masses of dense bush.

The rhododendron ponticum (too much used) and elderberry need no description except that both are good shade-bearers, and that is the most that can be said in their favour.

Most of the common willows will endure considerable shade, and they are easily and quickly propagated from tall cuttings stuck deeply into the soil in March.

None of the conifers of the Scotch fir, Corsican, or Austrian type are eligible for under-planting. They are light-demanders, and soon perish under the shade of other trees.

There are probably other shade-bearing subjects in the plant lists, but those named are the best known at present, are good growers and not too expensive.

Planting in
Groups.

In all cases of under-planting care should be taken to plant, not single trees here and there, which are practically useless, but groups of from half-a-dozen to twenty or more in the case of trees; and in the case of shrubs, masses of greater or less extent. It is found, in shooting, that covert, and room,

in the shape of open spaces, are the two essentials, and the clump system, in thin old woods especially, will be found to be better than scattered planting. Besides, groups are not so liable to be destroyed by rabbits as single trees are when no other food is near.

Plate 2, "A Cold Covert," shows a wood that might be quickly converted into a good crop of timber and a game covert by under-planting, as the overhead canopy is thin and broken, admitting sufficient light for such species as beech, spruce, Douglas fir, yews, and shrubs.

Some of the subjects here mentioned are more particularly adverted to in a later chapter.

CHAPTER VII.

ROOSTING TREES.

Spruce Fir Trees. Douglas Fir. Deodar.

THIS is a subject that concerns pheasants, black game, and wild pigeons chiefly. Roosting trees are absolutely necessary in pheasant preserves, and there should be plenty of them and of the right sort. The pheasant will roost on any tree, deciduous or evergreen, on the branches of which it can perch comfortably ; but it prefers a horizontal branched evergreen fir tree to all others. Many game preserves in England are almost destitute of firs, and the pheasants are driven to roost on the oak, beech, sycamore, &c., at all seasons, and get accustomed to such quarters—preferring the oak because the branches are often more horizontal than those of the other two and have a rough bark. Indeed we have doubted, sometimes, if pheasants, accustomed to deciduous trees, would readily take to the spruce and other firs if they had the chance, but the latter are undoubtedly the best—affording protection from wind, snow and wet, not to speak of poachers.

Spruce Fir.

In Scotch woods, where there is usually much spruce with branches down to the ground, owing to severe thinning, the pheasants seldom roost on any other. They are said to prefer the larch, and when the trees are old and have wide-

spreading limbs they do roost on them ; but they prefer the spruce and especially the silver fir. In extensive mixed larch and spruce woods, well stocked by wild pheasants, that we were once familiar with, the spruce was the tree most patronised, and the same might be said of the wild pigeons, which were plentiful.

There are some pines that the pheasant seldom or never roosts upon, and the Austrian fir seems to be the one most avoided—at all events such half-grown examples as one usually sees in British woods. When this tree reaches maturity it has long, clean limbs near the trunk, but its dense, bushy habit, and projecting, stiff needles—when young, prevent birds from perching on it. We have known common poultry to leave a comfortable hen-house, and roost on a group of Austrian firs close by, summer and winter, but they went under the trees and hopped up on the bare limbs near the stem. Pheasants *fly* on to a tree and like to see where they are going to alight. These objections apply also to the Scotch fir and some others of the brush habit of growth.

Probably the two best trees and most easily procured are the common spruce and silver fir. The latter is of a thinner habit than the former, has flatter horizontal branches, and at an early age is a roosting tree. We once counted as many as fifteen half-grown pheasants on the branches of a young silver fir about twelve feet high, growing in a wood not far from the coops, though there were other trees near, but no firs. The birds had worn the branches nearly bare of foliage.

An equally good, or even better, roosting tree is the *abies grandis*. Where the silver fir grows it grows even faster, and has wide-spreading horizontal limbs that in time form a gallery of perches one above the other. It is, however, a more expensive tree to plant than the silver fir, but it might be mixed with the latter.

Douglas Fir.

The Douglas fir is a grand covert and roosting tree—beating all others in its rate of growth, and it is not now very dear. It soon produces long side branches, which remain on down to the ground, when the tree is used for covert, and not planted too close. The inner part of the branches near the trunk soon get bare and afford plenty of roosting room of the most comfortable description. These horizontal inner limbs rise tier above tier, and comparatively young trees would often shelter a thousand pheasants easily. The only drawback to such an otherwise desirable tree is its rather dense outside habit, which prevents pheasants from flying into it as easily as into a silver fir ; but when used for under-planting, among oak for example, its habit is much thinner. Where black game and capercailzie are desired it is probably the most likely of all trees to attract them. When it grows densely and luxuriantly, access to the inside of the tree may be provided by cutting a branch clean out, here and there, from twelve to thirty feet from the ground.

Deodar.

A tree that the pheasants love is the deodar (Plate 8). It is rather a slow grower in the open, but in mixed woods it grows much faster and is sparsely branched. We are acquainted with many woods where the tree has been planted more freely than usual, and its height growth has been second only to the larch. In winter as many as fifteen pheasants have been found roosting on one deodar near a good covert, and underneath, the ground was littered with droppings like a henhouse. It gets drawn up quickly among tall trees and becomes an ideal roosting subject. It is warm, throws off snow like a roof, and is easily entered, while underneath the tree the ground is usually quite bare and dry. The deodar is not a shade-bearer, but it is a good marginal subject. There are other species of conifers that may be used as roosters, such as *Abies Nordmaniana*, *Abies nobilis*, and others, but those with flat, horizontal branches are the best.

In planting trees for roosting purposes the dense method of planting for timber should be avoided, as the trees shed their lower branches under such conditions, and are useless. The best way is to plant in groups of from three or four trees up to a dozen or more. At first the trees may be planted five or six feet apart, in informal groups, to promote height, growth and covert, but they should be thinned out before they get crowded, leaving the tallest. Twenty feet asunder will be about the right distance finally, but the Douglas fir may be given forty feet.

CHAPTER VIII.

TREES AND PLANTS THAT RABBITS DO NOT EAT.

Insuring a Crop. German Nurserymen, Corsican Fir. Mistakes. The Alder.
 Snowberry. Blackberry. Willow. Broom. Rosa Rugosa. Bracken.

IN the forefront of obstacles to planting, either for timber or covert, stands the rabbit pest. Extermination, or efficient protection by wire netting, are supposed to be absolutely necessary, and prevent many from extending their plantations who would otherwise do so. It is difficult to exterminate rabbits, and wire fencing is expensive.

Insuring a
Crop.

There is, however, an aspect of the question that has never been sufficiently considered, and which may be usefully adverted to here, that is, the raising of forest trees by a cheaper process than is usually practised, and planting much thicker than is usually done to insure a crop. One chief cause of the destruction of young plantations is thin planting, and planting at the wrong season. One rabbit will soon make big blanks where the trees are, perhaps, three to five feet apart, and it is certain that rabbits will always attack anything in the plant shape that is new to their runs; young forest trees newly put out—especially ash, sycamore and firs—act like baits to them, and the chance of destruction is very much greater when the trees are planted in Autumn, as they have then nearly six months of the rabbits' hungry season to contend against. Trees planted late in Spring, when vegetation begins to move, are far less liable to be attacked, and by the following autumn the rabbits have got accustomed to their presence and take less notice of them.

In any case, however, thick planting appears to insure a crop to a large extent. German foresters plant thickly against wild deer, which are very destructive, putting several plants in each hole, often only $2\frac{1}{2}$ or 3 feet apart—15,000 to 20,000 to the acre.

A suggestive fact in favour of thick planting is that in Coppice plantations, where no particular pains have been taken to keep down rabbits, ash and other trees, usually eaten by rabbits, spring up again when crops are cut, and form dense thickets in a short time, apparently defying the rabbits with impunity. This immunity appears to be due to the fact that the rabbits have got accustomed to the trees, which have ceased to be a tit-bit, and to the number of saplings on the ground. A solitary young plant forms only a few bites for a rabbit, but in a thick plantation one is only nibbled here and there, and a sufficient proportion escape serious injury.

If nurserymen could produce young forest trees at less expense, by transplanting less and putting out earlier, and if foresters would plant at least twice as thick as they do now, rabbits would not need to be seriously feared, and wire fences would not be needed.

German nurserymen appear now to be laying themselves out for this sort of thing, and are making serious inroads upon the British nurseryman's field of operations by delivering forest trees in Britain, equal to home raised and nearly fifty per cent. cheaper. We feel sure our home nurserymen might compete successfully on their own ground, if they would adopt cheaper methods, and not insist so much on frequent and expensive transplanting. Trees planted nearer the seedling stage, and less shortened by transplanting, would succeed just as well as older trees with most species.

German
Nurserymen.

Corsican Fir.

We come now to the question that heads this chapter—the trees and plants that rabbits do not eat, or at least only when they are pressed for food. This has been a debatable subject among planters for a long period. There are few or no trees or shrubs of any kind that rabbits will not try when driven by hunger, but there are some that have been tested and that are practically rabbit-proof, and these might be made far more use of than they have been. Among *trees* the *Pinus laricio*, commonly called the Corsican fir, is, according to general experience, rabbit-proof or nearly so. The true Corsican has however been confounded with other kinds that are not rabbit-proof, nor like it in other respects, and it is important that a tree possessing such exceptional qualities should be made as familiar to planters as possible.

Few, we believe, have planted the true *Pinus laricio* as extensively or more successfully than ourselves, or seen it under a greater variety of conditions. Owing to the tree being so often planted in the winter time, failure more or less, has been almost universal, hence good examples of Corsican plantations are few and far between, and owing to that, and the fact that botanists, and even some foresters, have classed the *Pinus austriaca* and *Pinus laricio* as one and the same, the former has often been substituted for the latter, and this, more than anything else, we believe, has frequently led to disputes in the “Field” and other papers as to the rabbit-proof qualities of the true Corsican—some finding it immune and others the reverse, the latter in all probability having got some variety of the Austrian and not the Corsican at all. The true Austrian fir never escapes the rabbits, if they are there, and is usually eaten down to the soil, while the true Corsican, under the same conditions, may be tasted but is rarely seriously injured unless there is nothing else on the spot to eat. Planted thickly enough in March, and by preference in April, few fail, and rabbits are hardly to be

feared. Plates 11 and 12 show the characteristic habits of the true rabbit-proof *Pinus laricio*. When Lord Ducie wrote, many years ago, that the Corsican was safe, even in a rabbit warren, he was not far from the mark. It is, however, just forty years since Senillis, one of the most careful of observers, stated in his "*Pinacea*" that he knew of no pine less subject to the attacks of game or vermin than the Corsican fir, and that he had frequently seen the Austrian and Scotch firs eaten by both hares and rabbits and disbudded by black-cocks, while the Corsican remained untouched. One of the best tests of the true Corsican is that it is a proverbially bad transplant, unless planted in March, April, or May, when it rarely fails, whereas the Austrian fir transplants successfully at any season. This we know from constant experience and observation on many estates.

The fact of the matter is, the history of the Austrian and Corsican firs is very mixed. There are at least half-a-dozen varieties of the Austrian, of which Plate 15 shows a common example; but there is only one Corsican, and its tall, slender, sparsely-branched habit, twisted, glaucous leaves, especially in the young tree, can never be mistaken. The regular uniformity of habit and colour in a bed of young Corsicans is remarkable. The Austrian fir varies greatly, and we strongly suspect that the seed has been collected from various sources in Southern Europe, from trees supposed to be the Corsican—hence the confusion. Mistakes.

The author of "*The Pinacea*" seems to have known the true Corsican well, and names several other varieties that have at different times been taken for it, *Pinus pallasiana* among others, from the Crimea, and which in turn is said to be synonymous with *P. taurica*, the only variety we have seen which in general appearance resembles the rabbit-proof Corsican.

Be these things as they may, we can certify, that the variety shown in Plates 11 and 12 has been found to be practically rabbit-proof wherever we have known it tried, and the plates show examples of thousands that have grown up without protection, where rabbits were more or less plentiful since the day they were planted.

The Alder.

The next rabbit-proof tree is the common alder. It may be tasted by rabbits when snow is on the ground, but we have found it to be practically rabbit-proof, and we have planted it freely with the Corsican and snowberry for that reason. The common alder has also the advantage that it is one of the most profitable timber trees to grow, because it produces a great quantity of timber to the acre, is in constant demand at good prices when from 3½ to 6 inches quarter girth, may be cut every fifteen or twenty years, and succeeds in any soil that is not waterlogged or too dry. The best timber is produced on moderately moist soils.

I have been assured also that the white alder, *Alnus incana*, but little known, is thoroughly rabbit-proof. It succeeds on dry situations, too, up to high elevations.

Snowberry.

The next subject on the list is the snowberry—a dense-growing deciduous shrub, about seven feet high, and which propagates itself quickly by suckers like the raspberry. The plant is also a good shade bearer. Years ago we saw a large tract of this shrub in a fox covert where there was nothing else left except the timber trees, and where rabbits swarmed. Soon after we tested it on a small scale under much shade, alternately with privet. The privet suffered much from the rabbits, but the snowberry escaped. Subsequently we planted it in an opening, of an acre or more, in a wood where rabbits had always been plentiful. This was about ten years ago. This patch, planted chiefly for covert where none existed, consisted of Corsicans, a few Austrians, yews, rhododendron, alder, and snowberry, in

clumps. Plate 13 shows one of the clumps in this plantation, seven feet high and some fifteen feet across, dense to the bottom and forming a soft, warm covert. When first planted, quite small plants, the rabbits tried the snowberry and the Corsicans promptly, but soon gave both up.

The blackberry, in addition to its other good qualities, already mentioned, comes also under the head of rabbit-proof subjects, and in the search for these the wonder is that it has not been made far more of. We are acquainted with woods, carpeted throughout with the common bramble, where rabbits have always swarmed, but never appeared to touch it—perhaps because of its prickly nature, as in the case of *Rosa rugosa*. We have seen many proofs of the bramble's immunity, and one notable case is worth mentioning. The owner of a well-known estate took legal proceedings against a shooting tenant for allowing the rabbits to increase to such an extent as to seriously damage his plantations. We were requested to inspect the said plantations, and whether preventable or not, there was no doubt about damage done, more or less, to everything except the bramble, which was untouched. It appeared to have been planted at regular intervals on both sides of a very long open ride, for covert and as a food producer, and every plant had formed a high, dense bush, the bramble having scrambled up over both the trees and coppice within reach, near the side of the rides, to the height of six or eight feet. We saw the wood in the middle of November, and the bramble bushes were then still laden with fruit—the keeper expressing the opinion that they were the best thing in the wood for the pheasants. This was in Wiltshire, but we have seen equally good examples in the north. There is hardly any limit to the uses the game preserver can make of the bramble—as covert, a shelter, food producer, and rabbit-proof subject where it is not shaded too much by trees. In the strong

Blackberry.

Sussex soil we have seen the bramble scrambling up young larch trees at the road side to the height of fifteen feet, or more, and fruiting almost the entire length of its long trailing shoots.

Willow.

A species, embracing numerous varieties of tree and shrub size, all easy of propagation, a shade bearer, and which rabbits do not like, is the willow, a subject not half so favourably known as it ought to be, if for no other reason than that it costs next to nothing to propagate it by cuttings that only need chopping into two feet lengths and sticking into the soil. The vitality of this tree is amazing, and it forms a dense, high thicket in two years. The way to use it is to insert the cuttings in March or even later, pushing them down deep, and planting thickly. Rabbits may nibble at them, but numbers tell, and after the first year the rabbits cease to be troublesome. The bark of the willow contains salicin, which gives it a bitter, disagreeable taste, which is probably the reason why it escapes. (Plates 4 and 5.)

Broom.

The common broom makes a very good covert plant, and as far as we have seen it is rabbit-proof. The broom and furze are near relations, and the two may often be seen growing together where there are rabbits and sheep, but while the furze is nibbled constantly, the broom is left, probably because of the bitter, disagreeable taste of the shoots.

Rosa Rugosa.

Rosa rugosa, Plate 14.—This very distinct variety of the rose is of comparatively recent introduction from Japan, where it grows, we are informed, in all situations down to high-water mark on the sea shore. In this country it is quite at home in almost any soil and situation, north or south, forming a dense bush. It is not an ideal *covert* plant because it grows too compactly, but it is very ornamental, and when planted in open margins of woods it grows fast and produces

extraordinary crops of hyss about the size of marbles, of orange-scarlet, crimson and yellow colour, with a thick, fleshy skin, packed with seeds. Both skin and seeds are devoured by pheasants and other birds, and rats and mice make sad havoc among them, climbing up the stems and clearing bushes in a few days. The stems are densely set with bristles and are unapproachable by rabbits. We have never known it touched. The plant is easily propagated from seed sown in common soil in shallow drills out-doors.

The common bracken we have condemned elsewhere as a covert plant in game preserves, but here we only recommend it, if required, as a certainly rabbit-proof subject, even in a rabbit warren, where it may exterminate the rabbits by encroaching and destroying the grass; but the rabbits will not destroy the bracken. The value of this subject, when rightly used in such situations, is hardly realised. Left to nature, it is a good enough covert in summer, but when the winter snows and rains come it goes down flat and becomes a naked waste, and every square yard of dense bracken means food lost.

Bracken.

What are usually wanted in rabbit warrens where natural covert is absent, are upstanding clumps where the rabbits can shelter and be easily dislodged in shooting. In some warrens rhododendrons have been planted for such purposes, but they take years to grow. In other cases bundles of brushwood are thrown down here and there in the warren and covered with cut bracken or straw, and a kick to the hillock bolts the rabbits. These contrivances, however, involve labour, don't last, and strew the pasture with rubbish. The live bracken makes a first-class bolting clump in a warren. The plant varies greatly in its rate of growth in different soils and situations, and needs a little management. On cold, wind-swept hills it grows barely six inches high; ordinarily it grows about three feet, but in woods it is often

six and eight feet high, and we have cut and preserved fronds that were twelve feet in length. In the latter case the plant had to do what all plants do under similar conditions. The ground where it grew was covered by a high pile of living and dead branches, and the bracken had to push its way up and through these to reach the light, when it developed a frond above the obstructions and held its own. It should be treated on this principle in a warren ; the bracken wants some support to hold it up and make it produce a roof. A pile of rough branches and limbs of trees thrown together over the bracken in winter will do ; but a frame-work erection two or three yards wide, of stout stakes and rails, is better and lasts, and amongst these brushwood may be put to thicken the heap. By mid-summer the bracken will have pushed through and quite hidden the structure. We have seen stones and sods piled together for a similar purpose, but such heaps only encourage burrowing and are insanitary. The bracken, treated in the above manner is good covert, and when it is mixed with bramble the one scrambles over the other, and both make a first-class retreat.

Among other subjects generally recommended in catalogues as rabbit-proof, or nearly so, are the rhododendron, mahonia, acuba, privet, yew, dogwood, common barberry, and others, all of which may struggle into covert if planted thickly enough, in spite of rabbits, but all of them are eaten when other food is scarce.

Establishing the common bracken where it does not exist is supposed to be difficult, but that is not the case. Transplanted late in spring, the rhizoms bleed and suffer a severe check, but if the roots are dug up by the spade, about October, in good lumps, and transplanted, they will push freely in spring.

CHAPTER IX.

RABBIT SHOOTING AND COVERTS.

Their Value. Effects of the Ground Game Act. Suggestions.

RABBITS undoubtedly contribute very largely to the head of game on some estates, afford good sport for the gun, require the least care, and probably pay better than any on the list. They are destructive in young plantations, but in old thin woods they do little harm, and where such woods exist and are not planted, they afford good covert for large numbers of rabbits, which fill a blank in game preserves, and afford sport when there is often little else to shoot. A shooting with no rabbits in it, when pheasants are scarce from any cause, is a dead letter, for unless a stray woodcock or an odd hare gets up there is nothing to shoot and disappointment is the result. Owners who cannot entertain their shooting friends, and have no fishing, are to be commiserated.

The Ground Game Act has now curtailed rabbit shooting on most estates and reduced the value of shootings to a serious extent. The tenants kill the rabbits, keepers are compelled to keep them down to avoid complaints and claims for damage, and the landlord is the real sufferer. On many estates on which rabbits were once plentiful, and where many were distributed among the cottagers and poor people of the estate at every shoot, and many sold to help the gamekeeper's account, there are now few or none. Farm

Game Act.

tenants are no more contented than they were before, and what between past and prospective legislation on the subject, game preservation seems likely to reach the prohibitive stage before long. Hares have practically disappeared, rabbits are in process of extermination, except where warrens can be maintained, and the pheasant is now proclaimed an enemy of the farmer also, but, as we believe, on very slender grounds indeed. What damage pheasants do to grain crops is almost inappreciable, and is usually covered, or more than covered by gifts of game or privileges of some kind. If all the game in the country was exterminated to-morrow it would probably make hardly any appreciable difference, financially, to the British farmer, and it will be time for the latter to complain further of damage by game when good-natured landlords insist more strictly than they do now on conditions of tenancy being fulfilled, refuse abatements of rent, and when the tenant cultivates the land at his disposal to its fullest capacity and conducts all his farming operations on more intelligent and economical lines. The claims for damage by game are not infrequently a fiction. We could record instances where damage by rabbits has been claimed where the culture had been so utterly poor, and the crops so miserable in consequence, that there was next to nothing for the rabbits to damage. Poor, unskilled, small holders are usually the most importunate.

We have always been in sympathy with the forester and farmer, as regards real damage by rabbits, where that could be prevented by ordinary care, but on very many estates throughout the country there are great tracts of neglected thin woods and coppice of next to no value to the proprietor except to stock with rabbits for sport or profit. Round, or near such woods, there are usually grass fields or farm lands, but, while the farmer may catch all the rabbits he can outside, the owner may not stock his woods to a

reasonable extent, let alone to their fullest capacity, if he wishes to avoid trouble with the farmer, who does not object to the rabbits so much if he can have them himself. In harvest time it is often interesting to watch a field of corn being cut from the outside to the centre, so as to drive the game into the last patch, when a battue takes place. It would surprise some to know how many hares and rabbits have been secured in this way in one afternoon.

There is a way out of this difficulty, however, if landlords would arrange matters differently. There are woods on almost every estate, in the present state of British Forestry, that are practically useless for any purpose but harbouring game, and that would produce an income from rabbits alone if the rabbits were allowed to breed and had access to pasture. Rabbits do not thrive when confined to woods where food is neither plentiful nor of the right kind. Whatever kind of herbage may exist in the wood, rabbits will seek the nearest grass fields to feed, hence the damage usually done to crops near the margins of woods. To get over this difficulty we have frequently suggested to landlords that they should take a strip of the fields adjoining the woods and shut it off with a wire-netting fence on the outside only, allowing a proportionate reduction of rent to the tenant for the piece taken in. Some gentlemen have done this, but they tell us that the tenants often assume a rather dog-in-the-manger attitude when anything of this kind is proposed. The land wanted suddenly becomes "the best on the farm," and compensation in the shape of reduction of rent is demanded in the same proportion. The plan is quite practicable, however, and a small strip of grass added would often give the owner more rabbits than he would lose in rent, and sport as well. The plan does not involve so much work as a regular warren. The strip need not be wide, and it should run the whole length of the wood and parallel to it. Rabbits do not go far from

Suggestions.

a wood or burrow to feed, and it is surprising what a large number a small extent of grass land will feed. We are sure of this from experience. In one case, where a wood ran parallel to a warren field on one side, the field, a comparatively narrow strip, was taken in for the sake of the rabbits and to prevent claims for damage by the tenant. The result was that the rabbits multiplied rapidly and were worth more than the previous rent. Such strips, however, should be kept free from thistles, which is not a difficult task ; and if the land is salted slightly, periodically, it will help the rabbits immensely. It is not sufficiently realised that rabbits, deer, sheep and cattle may almost be kept to any particular piece of grass land, without the aid of fences, that is periodically salted in spring and occasionally limed slightly. Cases have been known where cattle, deer and sheep have practically forsaken certain parts of a park throughout the season to crop portions that had been limed and salted, as long as there was anything left to nibble.

Rides in woods, grass drives, and all open spaces in game preserves where there is grass, should be freely salted and sprinkled with lime periodically. That will keep the rabbits on the spot, and, as far as we have seen, pheasants thrive on such ground as well. It may be accepted as a fact, proved to demonstration, that salt, and to a rather less extent lime, are necessary to the healthy existence of any great number of rabbits, and the application of both to open spots in woods or grass pastures will be far more than repaid by an increased number of rabbits of better size and quality.

CHAPTER X.

FOOD OF GAME.

WE do not wish to criticise the gamekeeper's practices unduly. As a rule he discharges his duties faithfully, according to his lights, particularly in regard to pheasant rearing, which taxes him to the uttermost ; but if he has one weakness it is in the matter of feeding game. The gamekeeper who has been accustomed, all his life perhaps, to artificial rearing is apt to lay too much stress on feeding, to carry it to excess, and to get the notion into his head that pheasants cannot exist without his daily assistance. It seems exceedingly probable, too, that some of the diseases that attack pheasants are often caused, or at least aggravated, by artificial feeding, which keeps them almost continually on or near the rides and paths in the coverts where the food is scattered because the keeper, as a rule, keeps to beaten tracks and the birds follow him. So accustomed, indeed, do the birds get to the keeper's rounds that the sound of footsteps, of a stranger even, on the ride will bring them into the open, looking expectantly,—any time before the coverts are shot.

In hand rearing, from beginning to end, pheasants are nursed and tended in such a way as to almost unfit them to cater for themselves. Young chicks require assistance, but half-grown and mature birds, once they are put out in the coverts, should be to some extent weaned and left to

search for their natural food. Feeding in the covert is often carried on when there is no need for it. In the south of England, where the climate is most favourable, and on estates where intelligent keepers were employed, we have seen the rides strewn with Indian corn and grain in mild, open weather in October and November, when hyps, haws, acorns, chestnuts, and other wild fruits and seeds were hanging or scattered in profusion, and when slugs, insects, grubs, and worms were uncovered wherever the surface soil or mould was disturbed. In such cases it is quite a common thing to see the corn left lying untouched, or until it gets so wet and soaked that the pheasants won't touch it.

Ignorance of the pheasant's habits under natural conditions is, as a rule, the cause of artificial over-feeding. Yet a gamekeeper, if anybody, should know, that there is probably not another game-bird so well able to take care of itself as the common pheasant. It can dig deep with its powerful bill in search of food, and unearth deeply-buried seeds and roots with its feet, when it requires to do that, but finds a very large portion of its food on the surface of the ground in the shape of grass, seeds and fruits alone. Grass and herbs form a large portion of the food of the pheasant, black game, and partridge throughout the year. The whole of the Gallinaceous family, including pheasants and domestic poultry, eat enormous quantities of grass, and there are many kinds of British grasses, a large proportion of which possess highly nourishing qualities in both blade and seed. It has been proved, that the live weight of cattle and their milk production are better maintained on pure, good growing grass than on any other kind of food, and no doubt the same applies to other animals that eat grass. Poultry, or pheasants, let out of confined pens occasionally into a field go at the grass like a flock of sheep turned into clover, eating steadily forward in a line until satiated. The crops of wild pheasants, where not

artificially fed, are usually well filled and contain an extraordinary mixture of natural food such as is seldom found in the crops of hand-reared pheasants at any time.

The pheasant's ability to cater for itself at all seasons is best shown where it is quite wild and uncared for. It has the remarkable gift of finding roots and seeds that it likes when buried under the soil, and often goes far afield in search of these. Years ago, when hand-rearing was little practised, game preservers hardly ever thought of feeding. The present writer was acquainted with an estate where wild pheasants were plentiful and did much damage in gardens, usually coming soon after daylight and making havoc among newly-sown crops. We have known a few pheasants to uncover a long row of newly-sown peas in one morning before six o'clock and eat the most of them, and also to dig up broad beans, one after the other, in the row, though buried three inches deep by the dibber. On one estate boys had to be employed from daylight to dark to keep wild pheasants out of the kitchen garden attached to the mansion. The seeds of trees and plants they soon find. On one occasion, in Norfolk, they found and ate almost every acorn in a sown plantation, digging them up in winter and spring. The ground was re-sown again the following year, the seeds being thickly red-leaded, and the pheasants found them again, but left them lying on the surface. We noticed in this case that the pheasants seemed to have located the seeds exactly where they were put in by the dibber and dug straight down for them. They discriminate too, and acquire a taste for specialities, as we have often had occasion to notice in gardens. In one instance hand-reared pheasants suddenly developed a taste for the bulbs of *lilium elegans*, and nearly destroyed many fine clumps in a flower border before their ravages were discovered and stopped by pegging squares of wire netting over the roots.

In short, pheasants are the most unlikely birds to starve of any whose habits we are acquainted with. They survive long and severe winters where they have to find their own food, and in spring always appear in fine plumage and condition as the breeding season approaches.

Of course we realise well enough that in the artificial rearing system the gamekeeper has to be guided by circumstances and adopt special methods, but in any case the nearer he can adapt his practice to nature the better he is likely to succeed, and he need never be anxious on the score of feeding.

The difficulty is to name subjects which the pheasant, left to its own resources, will not eat in the way of wild fruits, seeds, grasses, roots, insects, caterpillars, grubs and beetles, etc.; but in the case of fruits it prefers those that are sweetest and best flavoured.

Beginning with fruit bearers. The bramble, or blackberry, mentioned in preceding chapters so often as to need less notice here, heads the list. It grows freely in all soils and situations and bears abundantly just at the season when pheasants and other birds need it most, viz., from October till December, for the berries hang long after they are ripe. It is easily propagated by layers or seeds sown with the berry.

The wild raspberry comes next. It is much liked by game. The plant likes cool, rather damp situations, and a heavy soil, and bears fruit freely both in the shade and in the open. It is easily propagated by seeds and suckers and needs no further attention.

The elderberry is a most abundant fruiter and never fails. The two best varieties and strongest growers are the common black and the red berried. The black berried kind is the most common. The fruit is shed early on the ground, where pheasants find it. Clusters of elderberry fruit

thrown into poultry yards and pheasant runs are quickly stripped. The tree is not a very desirable subject in coverts, but pheasants seem to thrive very well where it is plentiful.

The common and Japanese privets are amongst the best covert plants and fruit bearers. The common variety is the best fruit producer, and the fruit remains on the plant till spring. Privet is rapidly propagated by cuttings of the young tops, chopped off six to eight inches long and inserted two-thirds of their length into the soil in thick rows in March and may be planted out in autumn.

Snowberry.—This plant has been favourably noticed already in preceding chapters as a fruit producer, shade bearer, and rabbit-proof subject. Its snow-white berries remain on the plant all the winter and attract game and birds. The plant propagates itself by suckers, and is easily multiplied by division. A root may be torn to pieces, every one of which will grow.

Cotoneaster.—There are two varieties of this plant well worth planting extensively along the margins of coverts, viz., *C. frigida* and *C. simondsii*. Both are hardy and good growers almost anywhere, and never fail to bear abundance of fruit, which attracts all kinds of birds. *C. frigida* is a most conspicuous subject when loaded, as it invariably is, with its scarlet berries; *C. simondsii* is an evergreen. Both kinds are quickly propagated by seed out-doors.

Rosa Rugosa.—This fine rose has also been alluded to before and described. Its main value lies in its abundant crop of hips, borne annually, and ripening from August till late in the autumn. The plant is exceedingly hardy and robust. The hips are borne well within the reach of pheasants, and are usually attacked as soon as ripe. Mice eat the seeds as well and the skin. The plant is easily propagated by seed sown out-doors in shallow drills.

The Hawthorn.—The value of the hawthorn as a food provider can hardly be over-estimated. It soon reaches a bearing age, is a beautiful and ornamental subject in parks and woods, bears pretty constantly, and scatters its fruit (haws) on the ground during the winter, where it is easily accessible to game.

Mountain Ash or Rowan Tree.—This tree, which is probably unsurpassed for hardiness and as a fruit bearer, on hill or in dale, and is also one of our most beautiful berried trees, is said to be a favourite food of black game, in whose haunts it is usually found ; but we doubt if it is of much use in pheasant coverts. The berries are not sweet or agreeable to the taste, and pheasants do not seem to care for them while other food is plentiful. Blackbirds and missal thrushes seem however to like them, and we have known these two birds clear a tree of its fruit in a few days within a few yards of a cottage door.

Common Crab.—Pheasants do not seem to be partial to the crab unless hungry, probably because of its sourness. We once thought they liked it, but since then we have often seen well-stocked coverts littered with fallen and fully-ripe crabs, and seldom touched while there was anything else to eat.

The following fruit or seed-producing trees and shrubs hardly need description, but before naming them we would refer specially to two trees that produce enormous quantities of succulent seeds that we believe are devoured by birds during the autumn and winter. These are the sycamore and ash. The foliage of both is regarded as good food for cattle in Germany, and we know from experience in the tree nursery that the seeds of both trees have to be red-leaded to keep birds or mice, or both, off the seed beds.

It is probable, indeed, that the seeds of most of our forest trees are eaten by birds, and the supply of food of that kind alone is usually distributed in abundance in all woods. Planters have often wondered what became of all the tree seeds shed in woods, and which somehow or other never come up. Do pheasants and other birds eat them? Rabbits do not account for them. It is stated by keepers, in practical handbooks on game preservation, that when there are many hand-reared pheasants on a beat, they will not only soon exhaust the natural food in the shape of ants and other insects and grubs, but will even completely clear the ground of the small grit necessary to the digestion of their food. What then is likely to happen to seeds shed annually from trees on the surface of the ground? The particular stage at which birds attack most kinds of seeds is just when they are sprouting, and what seeds are not picked up in the dormant state will hardly escape then. All gardeners know that this is the time seed eaters are on the alert and most to be dreaded.

The other trees alluded to as not needing description are the beech, oak, chestnut, sloe, birch, cherry, hazel and common barberry, the seeds or fruits of which are all eaten by feathered game and birds.

Other kinds of food, always found in greater or less abundance throughout the year in coverts and woods, are numerous kinds of grass and weed seeds, which are shed abundantly; and snails, caterpillars, many kinds of insects, worms, grubs, beetles, &c., the presence of which is indicated more or less on plants and trees that grow in woods. Caterpillars, pine beetles, and the like are always plentiful. The oak caterpillar alone, is always abundant in oak woods in summer, often to an excessive and injurious extent, and rooks, starlings and other birds gorge themselves upon them on the trees, while vast numbers of the caterpillar fall upon

the ground and underwood, to be picked up by game and other birds. We have seen hazel, and nearly every kind of underwood under oak, stripped of their foliage by the caterpillar, which had been hatched on the oak above. Many weevils, beetles and insects attack the oak, all probably devoured in their turn by birds, and what applies to the oak applies more or less to all kinds of forest growth. Woods teem with minute animal life, and probably such food is always more or less abundant and accessible except when the ground is covered with snow.

Intelligent keepers have drawn attention to the fact that when a hen or pheasant mother scrapes the soil in search of food, the young appear to look and discriminate but they do find something, for they are constantly feeding as fast as the mother scrapes the soil.

Black Game.

The foregoing remarks refer to pheasants chiefly, but they apply to partridges also, and in a large degree to black game, which thrive on the same food as pheasants, but add to it the buds and tops of fir, birch and other kinds of trees and heather. Practically black game are independent of the gamekeeper's assistance, though as far as "supplies" are concerned he is probably worse off than the pheasants. Contents of the crops of capercailzie and black game reveal, in winter at least, great dependence on a vegetable diet in the shape of buds of the Scotch fir and other trees, grasses and seeds. We have never seen black game more plentiful than where there were extensive spruce and beech woods, plenty of blackberry, blæberry and heather.

CHAPTER XI.

SHELTER SCREENS AND CLUMPS.

Favoured Counties. Belts. Dense Margins. Sunshine. Quick Growing Trees.
Lombardy Poplar and Willow. Best Evergreen Firs. Rule for Woodmen.
Effect of Wind on Trees. Sun's Rays.

IF we were asked the question what, next to food and feeding, was the most important consideration in connection with game preservation, we should say protection from cold, cold winds particularly—and wet. It has been long realised by farmers and stock breeders that exposure to cold in any form retards maturity in animals, and no doubt the effect is the same on animal life generally. The gamekeeper knows that cold springs retard the laying of his pheasants and the breeding of his rabbits, and that even on the same estate a difference of aspect alone may make weeks of difference in these respects. The rabbit is particularly susceptible to the influence of climate, and heat and cold. We have had occasion to remark that often in rabbit warrens, where aspect, next to food, makes all the difference—an £ s. d. difference—that is not half realised. In the severe winter and spring of 1894-5, when the temperature was constantly very low, rabbits could not be tempted to come out of their burrows to eat the food put down for them, and perished wholesale in their holes on many estates. In North Germany there are no rabbits, because they cannot endure the long, severe winter.

Favoured
Counties.

We have, from some experience in both, always regarded Norfolk and Suffolk as probably the finest counties in England for game preservation, because the average rainfall there is the lightest, the sunshine the most constant, and the temperature uniform.

Pheasant preservation is said to be best understood in these counties; but that can hardly be the reason, for hares and rabbits do equally well without any extra attention. On one estate of considerable size, the annual income from rabbits, quite recently, was seldom under £1,100 from the professional warreners who caught and marketed them and paid so much a score. This information I had from the owner and his agent. These rabbits were not got from enclosed warrens but from the waste tracts on the estate—in some cases derelict farms—where no care was given to the land, but which would have responded very much better in rabbit production if the pasture had received some cultural attention.

Shelter belts.

As regards shelter belts or screens in game preservation, the main object should be to keep out cold winds and currents. The great fault of our British woods, and which strikes continental foresters so much, are their naked margins, which afford next to no protection to either timber crops or game, and, as often as otherwise, the British woodman aggravates the situation thoughtlessly by beginning to fell his timber on the exposed side of the wood instead of on the sheltered side, letting the wind into the whole wood as at an open door. Intelligent continental foresters rather than create a blank on the cold side of a wood will allow even dead trees to remain as a wind break.

Dense
Margins.

The first duty of a keeper should be to concert measures with the forester for preserving a dense margin in all the woods and coverts so as to shut out wind. This concerns the forester as much as the gamekeeper, for trees are just as susceptible to cold currents of air and wind as game.

English woods consist, to a large extent, of deciduous trees, which are naked in winter, and the wind blows through them as through a sieve. The Scotch woods of spruce and other firs make better coverts, and probably the success with wild pheasants in Scotland is as much due to the covert as to anything else.

Severe frosts and cold, when the weather is still and calm, do not disturb game much ; but keen, penetrating, or persistent winds, such as often prevail in spring and early summer do, and in such weather pheasants will huddle together in any sheltered spot and rabbits will not come out to feed.

Then there is the life-giving sunshine, which cannot be admitted too freely to coverts. As a rule, rides and drives in coverts, especially in coppice plantations, are far too narrow. The tops of the trees meet overhead, or the rides run the wrong way and shut out the sunlight. In order to preserve marginal growth and promote sunny basking spots, rides should be wide, and the overhead canopy should not be continuous.

Sunshine.

Shelter screens should be made of the tallest and quickest growing subjects that can be found, for game preservers can never wait, and these subjects should be planted at the margins of coverts or woods, so as to shut out north, north-east, and east winds. One good single line of trees at the outside of a wood of considerable breadth will keep the whole wood quiet and comfortable, even when a gale is blowing, and a clump of spruce or Douglas fir in the midst of a thin wood, with its broadside to the gale, will provide a shelter that neither wind nor snow can penetrate.

Quick
Growing
Trees.

Unless a thin wood is blocked on the cold side, or, if it be a wide wood, at intervals, a current will be established from the cold to the warm side that will make the wood uncomfortable to game even in mild weather, and unbearable when keen winds blow.

As to the best trees to plant as screens, there are a number to select from, but the list does not include slow-growing subjects.

Lombardy
Poplar and
Willow.

For blocking the naked margin of a wood very quickly there are none to surpass the Lombardy poplar and the willow. Both are leafless in winter ; but the first can be had cheap eight feet high to start with, and grows fast, and the willow from cuttings will be ten feet high or more in two years, and probably twenty or thirty feet high the fourth or fifth year, and as dense as a hedge if used properly.

The value of these two trees consists in the fact that, although deciduous, they make a thick, twiggy growth, a first-class wind-break, plant easily, and are storm-fast. The Lombardy poplar, and there should be no mistake about the kind, is unlike all the other poplars in its close, erect, cylindrical habit, and if it is planted like a hedge, not more than eighteen or twenty-four inches apart, in single line, it will make a screen, only second to a stone wall, in a few years. The branches never spread, never need pruning, and if the height of the tree is an objection it may be topped without injury. To thicken the bottom of a poplar screen, the willow, its near relation, may be planted in front, close to the poplar. Some game preservers are now packing the outer margins of their cold coverts with willow alone, and a mixture of the tall and dwarfer kinds make the best covert, the dwarf bush kinds keep the bottom dense. (Plate 5.)

Best
Evergreen
Firs.

For a screen of the evergreen kind we must fall back upon some of the quick-growing conifera mentioned before in these pages.

The following extract from a paper read by Mr. W. J. Maxwell, of Terregles Banks, at a meeting of the Dumfries and Galloway Antiquarian and Natural History Society, and published in the "North British Agriculturist" of January 3rd, 1907, gives a very good description of the

growth, age, and dimensions of the kinds of trees wanted for our purpose. Terregles, in Dumfriesshire, may be said to lie about mid-way between the northern and southern extremities of Great Britain, and the trees mentioned succeed well a long way both north and south of the position named. We know the species well, and can testify to the descriptions given. Mr. Maxwell said :—

“ The following are some notes on various kinds of trees now available for planting, which I hope may not be without interest. A few days ago I measured some trees growing at Terregles. I find that a Douglas fir, one of several of the same age and size which was planted in 1886, has reached the height of 53 feet, with a girth, at about 4 feet from the ground of $4\frac{1}{2}$ feet. *Picea nobilis*, planted in 1885, have attained about the same dimensions. A *Thuja gigantea*, supposed to have been planted about 1882, but perhaps really five or six years earlier, is 61 feet high and 6 feet 4 inches in girth, with very wide-spreading branches near the ground, some of which, taking root, are rising round it like independent trees. Another *Thuja gigantea*, undoubtedly planted in 1882, but in harder, poorer soil, is 46 feet high, with a girth of 4 feet 8 inches. Larch planted in 1886 are 56 feet high and $3\frac{1}{4}$ feet in girth. Far surpassing these are specimens of *Picea grandis*, planted in 1882, and then two or three feet high—now 62 feet high and $6\frac{1}{2}$ feet in girth—60 feet of additional height in 24 years, and taking their thickness with them. And here I should like to draw special attention to this noble tree, for *Picea grandis* is truly a noble tree, worthy of its name, sound and hardy of constitution, a thing of beauty at all seasons, but especially in early summer, when the fresh young shoots so lavishly thrown out, show up in their brilliant green in contrast to the darker foliage behind. Beautiful in form and colour and in luxuriance of growth, it is an admirable tree for ornamental planting, and should prove a

good forest tree as well. If plants could be obtained more cheaply, we might have plantations of *Picea grandis* mixed with Douglas firs, in sheltered spots, which in beauty, rapidity of growth, and quantity of timber produced would surpass anything we have now, and would yield pretty good timber, too, though not equal to larch for outside use.

“ In rapidity of growth the trees above mentioned all far surpass the pines, *austriaca*, and *sylvestris*, and the latter have no chance when planted with them.”

For quick height and lateral growth the Douglas fir stands pre-eminent, and as a shelter tree, either singly or in lines, it cannot be surpassed. *Picea grandis* grows fast, but it lacks the density of the Douglas fir. The habit of the latter depends upon the way in which it is used. In some of the older and best known plantations of the Douglas fir in Scotland the trees have, owing to the dense shade created, shed their lower branches up to a height of forty or fifty feet or more, leaving the overhead canopy complete and causing a deep gloom beneath ; but on single trees, or on the outside rows of plantations, the branches are retained down to the ground—forming a dense, impenetrable mass, and an effective barrier to winds and gales. It is no uncommon thing to see trees and groups of trees of this species between thirty and forty feet high, at nine or ten years of age, and from twelve to fifteen feet in the spread of the branches. It may be guessed, therefore, what an excellent shelter screen the tree will make in a few years. Examples are now to be seen all over the country and in a great variety of situations.

Thuja gigantia is another rapid-growing shelter tree, and a single line, planted a few feet apart, will produce a screen such as can hardly be matched for density, in the time, while the tree takes up little or no room laterally.

The Common spruce grows wherever the Douglas fir will succeed, and makes a good screen for its size, but it is a comparatively slow grower. As a dense shelter hedge, however, it may be topped and clipped with impunity.

The Common beech is a tree that makes an excellent screen, and will endure either shade or exposure, hence is a good marginal tree in woods, only it does not compete with such subjects as the Douglas fir in rate of growth.

In the foregoing remarks we have had old and thin woods, such as one can often see through from side to side, in our mind, and that can only be sheltered in a reasonable time by planting purposely; but owners of young and middle-aged plantations, not yet thinned severely, may secure a good shelter to every wood by simply making it a rule that the woodman, in thinning, shall not touch the exposed margins within ten yards at least of the outside. No loss of timber is sustained by doing this, for the trees inside grow proportionately faster because of the shelter afforded. Trees are always shortest and poorest on exposed margins, and gather height growth as the shelter extends inwards.

Rule for
Woodmen.

Even casual observers are familiar with the fact, that trees near the sea coast, and on exposed situations inland, always appear to lean away from the wind as if they had been bent in that direction. That is not, however, the case. Growth has simply been checked or arrested on the exposed side by the prevailing winds, and the branches have grown to the side where there was least resistance, until, in very exposed situations, the tree becomes quite one-sided, and almost every branch points away from the wind.

Effect of
Wind
on Trees.

In concluding this chapter we would again reiterate the importance of gamekeepers realising the advantages of shelter and aspect in connection with the rearing of game of all descriptions. In all our experience nothing has struck us more than the persistent way in which animals, wild or

tame, fur or feather, seek shelter from cold, and haunt the sunny glades and margins in the spring and early summer—sheltering at night in the densest covert they can find.

Sunshine.

Another point, not sufficiently realised, is the difference the angle at which the sun's rays strike the ground, makes to the temperature of the soil and situation, or one would not see, as we have often seen, the rearing ground for pheasants chosen on a distinctly north-east aspect where the snow and hoar-frost lay, perhaps, for days or hours, as the case might be, after both had disappeared from the sunny slope of the same field. A very few degrees difference in the angle at which the sun strikes the ground will make days of difference in the duration of a frost in spring or early summer, and the effect on crops of all kinds is always conspicuous. Game preservers cannot always choose their ground, but for all important operations connected with game-rearing and preservation, protection from adverse climatic and weather conditions should be one of the first considerations. Make most of the naturally favoured spots, and avoid cold and shady situations affecting the duration of the sunshine in spring and early summer.

CHAPTER XII.

SUPPLEMENTARY NOTES.

Light Demanders and Shade-Bearers. Under-planting. Notes on Trees.
The Holly and Yew. Value of Furze or Gorse in Rabbit Warrens. Value of
the Willow. Trees for Covert at High Elevations.

THESE notes are intended to explain more fully than could be done in the foregoing chapters some of the particular habits and uses of trees and shrubs already recommended for game coverts, and also the meaning of such terms as "Light demanders," "Shade-bearers," "Overhead canopy," "Under-planting," etc., terms which have a special significance to planters and game preservers.

LIGHT DEMANDERS AND SHADE-BEARERS.—These are comparatively new terms in British forestry, and ignorance of their meaning has led to many mistakes and much loss in planting, either for coverts or timber.

Light
Demanders
and Shade
Leaves.

"Light Demander" means a tree or shrub that will not succeed for long under the shade or drip of other trees, and hence are useless for what is called "Under-planting" in old or established woods where the "Overhead canopy" of branches is dense, even if it is broken in some places. In open spaces where the sunlight hits the ground, if only for part of a day, light demanders may be planted, but they will not thrive as well as they would do if they had the sunshine

from morning till night. This is always very noticeable where such planting has been attempted. Some of the most sensitive subjects in this respect are the larch, the Scotch and other pines of the same class, the ash, birch, alder, oak and chestnut.

The best shade-bearers are the beech, common spruce, Douglas fir, most of the spruces, hornbeam, yew, holly, common laurel, privet, snowberry, rhododendron, bramble, and elderberry. Under "shade-bearers," hardly anything will succeed for long, but for killing all undergrowth outright, the beech, spruces and pines are the worst, destroying even the grass in time. The elderberry, too, is destructive in this respect. It prevails to a great extent in many coverts, is difficult to exterminate, and nothing will grow under it.

Under-
Planting.

"Under-planting" is usually most successful in mixed woods of evergreen and deciduous trees; and wherever there is a fairly good covering of grass in a wood, shade-bearers may be tried. It must be borne in mind, however, that even shade-bearers need light, and succeed best in the open, but the texture of their foliage and abundant leafage enables them to endure a good deal of shade.

Notes on
Trees.

NOTES ON TREES : *Douglas Fir*.—It may seem superfluous to refer to this tree again, but though the name is familiar now, in print, the tree is really known to comparatively few woodmen or planters by sight, and the description given by those who know it is hardly credited by some. A tree that, at a little over 40 years of age, puts on 400 cubic feet of timber per acre annually, worth 1s. per foot, as has been recorded of the Scone Douglas firs on the best authority, may well surprise those not acquainted with it, but we have seen the trees referred to, and many other examples over the length and breadth of the country, between the far north and the extreme south, and can safely say that for future

planting, either for game or timber, there is at present no tree to equal or approach the Douglas fir. Its habit is thinner when used for under-planting, but it makes an ideal roosting tree for young pheasants in a few years.

The Douglas fir has hitherto been expensive to buy, owing to the demand ; but it is being propagated on a great scale in this country and on the Continent, and trees 10 to 20 inches high can be had for less than 30s. per thousand, and one year old seedlings for 5s. per thousand. The tree is now well enough known throughout Great Britain and Ireland to warrant the opinion that in height growth it will be a 200 feet tree in this country at no great age. It grows at an average rate of 2 feet or $2\frac{1}{2}$ feet annually, and at nearly double that rate up to 20 years. The tree was introduced about 1830, but few trees were planted before 1840, and there are very few plantations of any age in existence as yet.

As a covert tree it is not approached by the silver fir or the common spruce, both of which it is rapidly superseding. There are numbers of single Douglas firs scattered throughout the country ranging from 100 to 150 feet in height, and probably not exceeding 50 or 60 years of age. The "Gardener's Chronicle" of January 26th, 1907, states that : "In a communication to the 'Zeitschrift für Forst und Jagdwesen' for 1906, the head forester reports on a plantation of Douglas fir which Mr. John Booth made with the co-operation of Prince Bismarck, twenty-nine years ago. The progress has been very extraordinary. We cannot print all the details which are given in German measurements, but we may say that in the beginning of 1906 the Douglas fir is credited with 95·68 cubic metres of timber, whilst the common spruce (*Picea excelsa*) yielded, during the same period, only 48·64 cubic metres, so that the Douglas fir yielded about double the amount of timber, and as the value of the Douglas fir timber is about three times greater

than that of the spruce, it (the Douglas) has in the course of twenty-nine years benefited the planter six times more than the spruce. Mr. Booth, who obliges us with the above details, may say with truth, 'I think the question whether the Douglas fir is a tree profitable for planting is settled.' " This is very good, but from what we have ourselves seen of the Douglas fir in different parts of Britain, we think the above dimensions and values have been considerably exceeded.

As a roosting and shelter tree we have already referred to it, but planters must be careful to get the true, Vancouver, quick-growing, green variety, as seen in all the older Douglas firs growing in this country, and avoid any of the dwarfer, glaucous-leaved, so-called Colorado kinds, which are quite inferior, and have often been substituted by nurserymen since the demand for the Douglas has increased. The tree succeeds everywhere when not too much exposed to keen cutting winds. It is a good shade-bearer, and may be used for under-planting.

Abies Nigra and Abies Alba.—Both these spruces have been mentioned, among others recommended for marginal planting, as rather dwarf, close-growing, covert subjects, that afford shelter. Both are shade-bearers and good growers.

Common Norway Spruce and Silver Fir.—These two species have been long known and planted as covert trees, but both are being superseded by the Douglas fir. They are, however, sold at a low price, and may be mixed with the Douglas fir as Covert, to fill up until the latter overtops them. As a rule, wherever these two spruces succeed the Douglas fir will grow, and all three are shade-bearers. When the Douglas fir was first planted in Scotland it was mixed with larch and spruce, but it soon extinguished its nurses.

Japanese Larch.—Gamekeepers praise the common larch as a roosting tree for pheasants, but it does not equal the Japanese larch, which has come to the front of late years both as a better grower and a disease resister. Japanese forest authorities give it a high character as a tree that reaches 100 feet in height, and as preferring high elevations. We know the tree well in this country, and can testify to its extraordinary vigorous and rapid growth, and freedom from disease. It is also more beautiful than the common larch, has a richer and more luxurious foliage, and branches well. Sir Herbert Maxwell has given it a high character in these respects, and says it can hold its own mixed with such rapid growers as the Douglas fir, and stands late frosts in this country that severely injure the common larch.

Deodar.—This fine tree, akin to the larch, but is scarcely known as a plantation tree (Plate 8), gives a good idea of its general habit growing at the edge of a wood, but it succeeds well with the larch and Corsican fir, and holds its own in height growth far better than is generally supposed. Its timber is of the highest quality. It is a light-demander, but succeeds in a mixed wood, and grows faster and more cylindrical than it does in the open. Examples are to be seen at Newstead Abbey, Notts.

The Pines.—Under this head are included only three well-known species suitable for our purpose, viz., the Scotch, Corsican, and Austrian firs. The Corsican has already been fully described in the chapter on rabbit-proof trees, and all the three thrive under the same conditions, but none of them are shade-bearers or suitable for under-planting in old woods, where they soon dwindle and die. A mixture of the three makes an excellent screen and shelter to a covert on high-lying exposed situations. Three rows, consisting of the Corsican at the back to give height, next the Scotch, and inside the Austrian would make a belt that would preserve its density from the ground upwards, and take up little space.

The great difference between the spruces and the pines is that the first do not endure keen cutting winds anything like as well as the three pines named do, whether inland or on the sea shore ; and it is quite a common thing, on the eastern slopes of the Pennine Range, especially as we approach the coast, to see both the silver fir and common spruce either dead or dying on the exposed margins of woods, where the three pines named are quite healthy. All the three are at home in almost any soil that is naturally well drained, in high or low situations, and they have the very decided advantage that they make the least demand upon the soil, and thrive on poor sand hills as well as anywhere, as plenty of examples in this country and on the continent testify. *Pinus maritima* has the reputation of being specially fitted for sea-side situations, but it does not excel the Austrian and Corsican. All the three love the light, and for that reason it is not advisable to mix them indiscriminately, as the Corsican always overtops the Scotch and the Austrian, and the dwarfest suffers from the shade of the taller species.

Thuja Gigantia.—This is the best of the numerous *Thuja* family for covert, as it grows fast, and is of tall and close habit. It is only useful as a screen, however, being too compact and close habited for general planting. It takes up little room and makes a high hedge in a short time.

Holly and
Yew.

Evergreens : The Holly and Yew.—These may be classed together, for although distinct species, they resemble each other in several ways, and are two very ancient British species often found growing naturally together in old parks and “chases” in England and Scotland. Among evergreens they are not surpassed as shade-bearers, and will live and thrive under the drip and shade of the taller trees in old woods. It is a fact, in regard to the holly, that when snow is on the ground, if there be a dry, warm spot in the wood, it will be under and round some old holly tree

or bush, and in cold weather pheasants will be flushed there if anywhere. Both the holly and yew produce masses of small roots near the surface, which seem to absorb the moisture at all seasons and keep the soil dry under and around the tree, and probably the dry ground attracts the pheasants. Both trees transplant successfully up to 30 or 40 years of age. We have moved old hollies in every month between April and August, but May and August are the proper months for the holly, and failure is almost certain to result in either young or old plants if planting is attempted between November and April. Hollies are expensive, but if foresters would only take the trouble, thousands of the common holly might be raised from the berries of one tree. There are many varieties of the holly, but for covert and under-planting the green varieties are the best, and the two best amongst these are the common holly and a variety called "Shepperdii." The first is unsurpassed as a berry bearer, and the second is perhaps the most robust variety in cultivation, but it does not produce berries.

Common Laurel.—Called Sweet, or Bay Laurel, in nurserymen's catalogues. This plant, which often reaches a height of twenty feet, endures shade and grows everywhere, is a much better covert plant than the rhododendron, for pheasants at any rate, because while it grows fast and makes excellent warm covert it is never too dense for the pheasants to run amongst, nor difficult to beat. When it gets too tall it will bear any amount of cutting, and it may be clipped into the form of a hedge or a bank, slashed, or laid anyhow without hurt. This shrub has become quite naturalised in many parts of the south of England, where it flowers and fruits more freely than it does in the north. It is one of the most beautiful flowering shrubs we have in early summer, and fruits abundantly; but whether birds eat the fruit or not, we cannot say, but they seem to like the covert.

Value of
Furze.

Furze or Whin.—*For Rabbit Warrens* (Plate 16).—In this plant the gamekeeper has one of the most valuable of covert plants, and for his rabbit warren a plant which rabbits cannot destroy, once established, and which at the same time insures a supply of food of the most nutritious description. Plenty of ground, with fair proportions of grass and furze, would probably be one of the safest and most profitable investments in the shape of a rabbit warren that the game preserver could wish. We have used the plant ourselves, raised it from seed in the middle of warrens, and know its value. Furze is known to the agriculturist, but not to the gamekeeper. The able author of "Agriculture" in the "Encyclopædia Britannica" thus writes of furze, every word of which we can testify to be true: "In the case of very poor, dry soils, it (furze) does however yield much valuable food at a season when green forage is not otherwise to be had. It is, on this account, of importance to dairymen; and to them it has this further recommendation, that cows fed upon it give much rich milk, which is free from any unpleasant flavour. To turn it to good account it must be sown in drills, kept clean by hoeing, and treated as a regular green crop. If sown in March, on land fitly prepared and afterwards duly cared for, it is ready for use in the autumn of the following year. . . . This plant is invaluable in mountain sheep walks. The rounded form of the furze bushes that are met with in such situations shows how diligently the annual growth, as far as it is accessible, is nibbled by the sheep. The food and shelter afforded to them in snowstorms by clusters of such bushes is of such importance that the wonder is our sheep farmers do not bestow more pains to have it in adequate quantity. Young plants of whin are so kept down by the sheep that they can seldom attain to a profitable size unless protected by a fence for a few years."

On many of the best mountain sheep pastures in north and south Wales, and which we are familiar with, the sheep almost live on the furze, which is fast disappearing in many places in consequence. The furze never gets high, seldom flowers or seeds, owing to the persistent nibbling—the plants looking like so much topiary work, and as if they had been clipped by shears. In the Kerry district of Montgomeryshire, where the mutton is noted for its quality, the sheep live to a large extent upon the furze, and so do the rabbits there. In one warren, in South Wales, the most populated portion of it is covered with furze, and nothing else, and over the whole tract every bush is nibbled down to a tuft, so compact as to resemble a big pin-cushion more than anything else.

In furze the rabbit warrener has got a plant that should relieve him of all anxiety as regards food and covert, summer and winter, if he will use it in the right way. One of the most extraordinary facts connected with furze is the way it continues to exist and thrive when grass pasture has become impoverished and where nothing else will grow. It has existed for generations on the same spot, on hill pastures, and nothing but overstocking with sheep seems to do it much harm. In the latter case it is sometimes only detected among the grass. Naturally furze reaches a height of seven feet.

Furze is easily raised from seed in one year, but it has to be netted from sheep and rabbits the first season, otherwise they will eat it off as fast as it grows.

We do not know any subject to equal furze as covert for a rabbit warren. It provides the best of shooting facilities if kept within bounds, and in good-sized isolated clumps with grass between. Then the best of sport is afforded. When the furze is allowed to cover the ground in unbroken masses the grass dies off, and the rabbits are difficult to put up; but if kept in clumps the rabbits run from one to the other,

and may be bolted time after time when the warren is shot over. The most extraordinary rabbit shoot we ever knew was in a twenty-five acre warren, where temporary covert clumps were made on the above principle, and the rabbits trapped out of their burrows the night before. The guns got almost too hot to hold.

Common Bramble or Blackberry.—This plant, so favourably referred to elsewhere, should be included amongst evergreens, though not classed as such by botanists. Both rabbits and hares lie out in it in winter, as it affords shelter, and pheasants often nest amongst the trailing shoots. Botanists distinguish some twenty different varieties of the common bramble, but for covert purposes the common blackberry type is the best, being the strongest grower and most fruitful, and, with a little assistance in the way of support, forming quite a high and large mass of branches and excellent covert. Without support in woods it covers the ground knee-deep, often to a great extent.

Deciduous Trees and Shrubs.—All our common forest trees are of course useful for game covert, and are more or less indispensable where pheasants are reared, but here only some of the most useful species are specially referred to.

The Willow.

The Willow.—This tree is specially deserving of notice as a covert subject far too little used and appreciated. The willow is almost confined to temperate and sub-arctic regions, hence may be relied upon for planting in cold and exposed situations. It is popularly supposed to prefer very moist or even wet soils, but that is a mistake, as all the varieties succeed in ordinary soils and grow rapidly. The White Huntingdon willow and its varieties attain to the height of 100 feet and produce good timber. Nearly one hundred varieties of the willow are said to be found in Great Britain, but the most useful kinds commonly grown are the Huntingdon and the shrubby-habited kinds like the bitter Osier

Salix Pupurea, which may be grown as an osier or as a hedge or belt, when it forms a good wind-break. Probably no kind of tree forms a covert or screen so quickly as the common Huntingdon willow mixed with the shrubbier varieties like *Pupurea*, *Viminalis*, *Acuminata*, and others. We have known the Huntingdon willow to produce shoots ten feet long or more in one season, in the north, and some of the shrubby kinds may be had six feet high by October if put in as two feet long cuttings in March, and ten or twelve feet high by the second or third year, while a still higher screen may be had by mixing the tall and dwarf varieties. There is no better sea side tree than the willow. It grows with extraordinary rapidity on the pure sand banks of Lancashire, where it has been extensively planted almost down to high-water mark, as a shelter-tree to gardens and woods. We understand that willows are now being planted extensively on the old pit hills in the Black Country by the Midland Afforestation Association, to whom the plan was suggested, and no doubt will soon transform the face of the landscape. The propagation is extremely easy, cuttings are easily procured, and a man may cut and plant thousands in a few days. For ornamental planting, especially near water, few trees surpass the golden and scarlet-barked willows. Both are close growers and do not get too high. There used to be some beautiful examples of these at Culzean Castle, in Ayrshire.

The willow is very subject to the attacks of a number of saw-flies and other insects, which do not however seriously affect the health of the tree, and the insects probably afford food for birds. Some of the caterpillars feed openly on the leaves, but their presence is usually indicated by galls and swellings on the leaves, quite often every leaf being affected, the lumps being easily felt by the hand.

Covert on
High
Elevations.

Trees for Game Coverts on High Elevations.—On great tracts of what are, in the Agricultural Returns, called “high-lying and waste lands” there is abundant scope for forming game coverts. The plea that timber crop prospects are too remote under such conditions does not apply to game coverts, because they are habitable and frequented by game at an early age—when a few feet high, in fact, and on many estates there are poor lands at high elevations that could certainly be converted into good shootings. A few wealthy proprietors are now planting their bare hills and uplands with this view, and the following are the subjects selected for planting:—The common spruce and Scotch fir, birch, alder, willow, beech, mountain ash and furze. These species are about the hardiest, and are known to succeed on high elevations and in latitudes where hardly any other trees will grow.

The plan adopted is not to plant great areas, but what may be called big clumps, consisting of an acre or more, not too far apart, and within sight of each other, and to plant thickly, say two-and-a-half feet apart. All the species named are found growing at high elevations in this country and in northern regions—the birch, alder, willow and mountain ash especially; and it is surprising how fast such subjects grow when they get a few feet high and begin to shelter each other.

The common blæberry readily associates itself with such plantations, and is soon established anywhere. We have seen it torn from the ground and from rocks in huge sods, and transplanted by simply laying it down on the ground and laying a few stones on it to hold it down. It fruits abundantly at high elevations in the open, and also under a certain amount of shade.

In planting at high elevation it is, of course, advisable to plant the warmest exposures and least drained spots, and deep ravines and gullies that face any point to the south, south-east, or west. Such spots are soon filled with trees

of various kinds, and become harbours for a variety of game. On wind-swept hills it takes a long time to establish covert, and as there are generally some choice of situations, the most favourable should be chosen. As a nurse for trees at high elevations the willow will be found invaluable, and it will form a good covert by itself where other species fail.

There has been much planting of Scotch fir and spruce at high elevations, but it takes a long time to get up plantations of these. The species before-mentioned will grow feet while the firs are making inches. Consequently they meet and form overhead canopy sooner, and growth is then much quicker.

THE END.

Game and Game Coverts.

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To Owners of Woods and Coverts.

The Author of "The New Forestry," "Game and Game Coverts," &c., &c., begs to state that he has, as far as practicable, anticipated the wants of his readers in his books, but in consequence of the enquiries he constantly receives from owners of woods, he wishes to state that he advises on all subjects connected with woods and game preserves.

He inspects woods separately, takes stock of their contents, condition and value; reports fully, sets out timber for sale, arranges planting operations, makes out lists and estimates, directs labour, and when engaged by the year, over-looks the whole work of the woods. Terms moderate, according to distance.

He has for a considerable time been engaged in re-organising the woods on a number of estates throughout Great Britain, his acquaintance with woods and game preservation in nearly every county, and knowledge of Continental and British forestry, enabling him to advise under a great variety of conditions.

When personal inspection is not desired, he advises by letter, if particulars regarding soil, climate and situation are furnished.

List of some of those Noblemen and Gentlemen by whom the Author has had the honour of being consulted, or whose woods he supervises.

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